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Quarterly Journal

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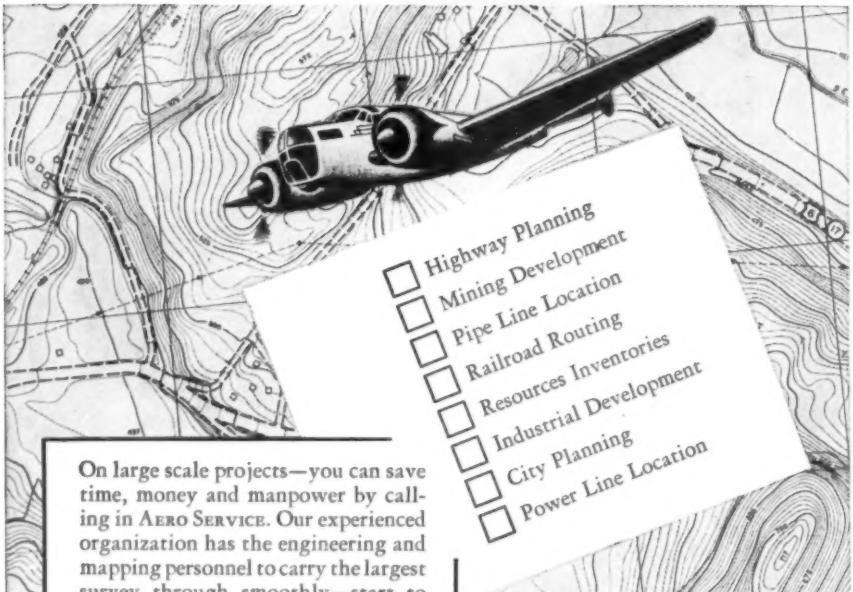

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For further information, write to

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INDEX TO ADVERTISERS

Abrams Aerial Survey Corp. 124
Aero Service Corp. ..... Cover 2
American Paulin System ..... Cover 4
Bathey Manufacturing Co. 274
Bausch & Lomb Optical Co. 123
Bausch & Lomb Optical Co. 223
C. L. Berger & Sons, Inc. 143
Bludworth Marine 181
Di-Noc Co. 128
Edo Corp. 172
Fairchild Aerial Surveys, Inc. 149
Geo-Optic Co., Inc. 215
W. & L. E. Gurley 120
Kern Instruments Inc. 271
Keuffel & Esser Co. 179
Keuffel & Esser Co. 275
Lufkin Rule Co. 178
Monsen 273
Ottico Meccanica Italiana 272
Park Aerial Surveys, Inc. 229
R. L. Sargent Co. 127
Surveyors Service Co. 276
Transograph Co. 216
Universal Instrument Co. 181
Wallace & Tiernan 125
Warren-Knight Co. 229
Wild Heerbrugg Instruments Inc. .. Cover 3
Willys Motors Inc. 126
Zeiss-Aerotopograph 122

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SURVEYING AND MAPPING

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A QUARTERLY JOURNAL
DEVOTED TO THE ADVANCEMENT OF THE SCIENCES
OF SURVEYING AND MAPPING

Volume XV, No. 2
April–June 1955

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How to Eliminate Errors in Precise Alignment

"In prolonging a precise line, as in tunnel surveying, it is important to eliminate, if possible, all errors which are cumulative," writes George Gabus of Livingston Manor, N. Y., engineer with the New York City Board of Water Supply.

"When a transit is set up *over* a point and a line is prolonged by the method of double centering, all errors due to instrument maladjustment are eliminated.

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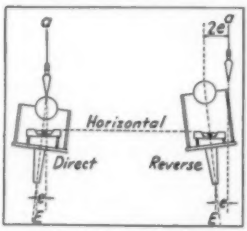
"The drawing *(see below)* shows an error which can accumulate by progression when the plate level at right angles to the line of sight is not in adjustment.

"Assume that the instrument is leveled and the dimple of the telescope brought under the point of the bob with the telescope normal and pointed toward the backsight. Since the plate levels are out of adjustment, the vertical axis will be inclined. Further, the center of the instrument will then be over some point 'E', which is *not* vertically under the point of the bob, even though the telescope's dimple is.

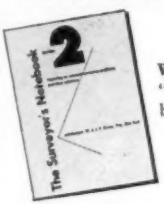


"When the plates are turned through 180 degrees, the instrument must be re-leveled; for the vertical axis will have to be inclined an equal amount in the opposite direction, if the plate level bubbles are to return to center. This has little effect on the instrument center which remains over point 'E'; but the telescope moves out from under the point of the bob. If, while taking 'direct' shots and facing the heading, the plate level's left end is low, the line is displaced to the left and vice versa.

At Willowemoc, N. Y., George Gabus sights with a Gurley transit during construction of tunnel for New York City's Delaware Aqueduct System.

"Let 'e' equal the error at the first transit scale and 'n' equal the number of the last foresight scale. Then accumulated error at the *n*th scale will be $e \times \frac{1}{2}(n^2+n)$ which amounts to 120 times 'e' for only 15 scales.

"**The moral:** keep your instrument in adjustment and/or reset the instrument under the bob when preparing to sight reverses. Naturally, you have to start off with a fine instrument. I'm buying a Model 82-R Gurley transit. It can't be beat for tunnel work and retracing compass surveys in these Catskills."



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Contents

Volume XV
Number 2

INDEX TO ADVERTISERS 118

INTRODUCING THE NEW PRESIDENT OF ACSM 129

THE FIFTEENTH ANNUAL MEETING 131
Morris M. Thompson

THE FEDERAL GOVERNMENT IN THE FIELD OF SURVEYING AND MAPPING 144
Douglas R. Woodward

REAPPRAISAL OF RELATIONSHIPS BETWEEN SURVEYING, PHOTOGRAMMETRY, AND ENGINEERING (A Panel Discussion) 150
Dr. N. W. Dougherty, Moderator; Paul H. Robbins; Lewis A. Dickerson; Leon T. Eliel; Michael Baker, Jr.; Robert H. Lyddan; and *Carroll F. Merriam*

THE ADJUSTMENTS OF THE JIG TRANSIT 173
Philip Kissam

MAP USE IN CITY PLANNING 180
Leo J. Zuber

SHORTCOMINGS OF CONTOUR LINES 182
Lloyd E. Marsden

BOUNDARY PROBLEMS ASSOCIATED WITH THE CONTINENTAL SHELF 189
A. L. Shalowitz

RELEVEMENT 212
Paul E. Wylie

BOXING THE COMPASS 217
Richard L. Threet

CONTROL SURVEY ACTIVITIES OF THE U. S. LAKE SURVEY 220
W. T. Laidly

SURVEYING AND MAPPING NEWS 224

BOOKS IN REVIEW 230

MAP INFORMATION 233

COMMENT AND DISCUSSION 237

NEWS OF RELATED ORGANIZATIONS 245

CONGRESS NEWS 248

PERSONALS 264

ANNUAL FINANCIAL STATEMENT 265

NEW MEMBERS 266

SUSTAINING MEMBERS 269

CONGRESS DIRECTORY 269

MEMBERSHIP APPLICATION BLANK 270

NOTICE ON ORDERING REPRINTS 270

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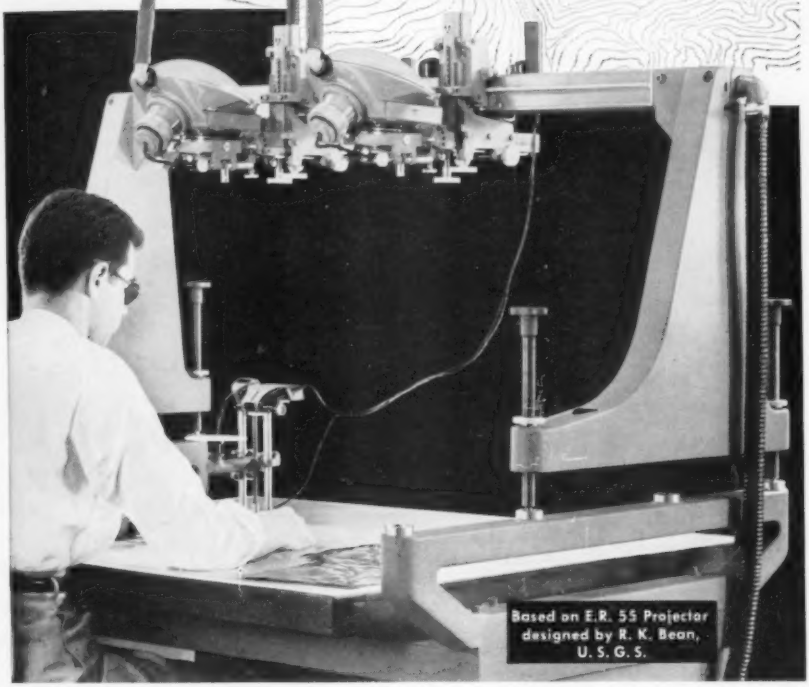

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PAGE TWENTY-FOUR

TO SOLVE ENGINEER PROBLEMS

Air Survey Gets Green Light from Road Builders

The American Road Builders Association, at its annual meeting in January at New Orleans, went all out in its recommendation of aerial photogrammetry. The road builders gave concrete testimony of their faith in air survey in stating it is a "prerequisite of economy in personnel" if the present shortage of engineers isn't to stalmate President Eisenhower's $101 billion road program.

Enthusiastic approval of aerial survey was given the assembled members and press in the Report of Task Force No. 1, on Planning and Design. The report was an evaluation of the ability and readiness of the engineering profession to design for the program, "to eliminate the $101 billion deficiencies in the nation's highways in a period of ten years."

In analyzing the problem created by the shortage of engineers, the Task Force reported "Location and cross-section surveys - - - can and should be performed more extensively by aerial photogrammetry."

Must Use Modern Methods

In plotting the course for the future, the road builders' committee pointed out, "Full use of modern survey methods - - - are prerequisites of economy in personnel."

According to the four Task Forces which reported on Planning and Design, Material and Supplies, Construction, and Construction Machinery and Equipment, the only impediment to complete adjustment to the planned history-making program is the shortage of engineering talent. In material and equipment, aid can be recruited from other lines of industry but in engineering talent, there is no surplus in any area. The competition for engineers in all lines of industry is a serious problem.

Fortunately, aerial photogrammetry has in recent years acquired the accuracy and engineering acceptance that has given the authoritative A.R.B.A. confidence in the photogrammetric industry's ability to take over the field and plotting work.

In conclusion, the Task Force Report summed up the solution with "Through the extensive use of aerial photogrammetry and standard plans and specifications, by transfers from other construction fields, and by training of new personnel, the requirements can be met."

Most Successful Meeting

The New Orleans meeting of the A.R.B.A. was considered by the officers and members the most successful and best attended in the history of the organization. Although the road building industry has been working at near capacity, it was indicated that the President's big program can be handled.

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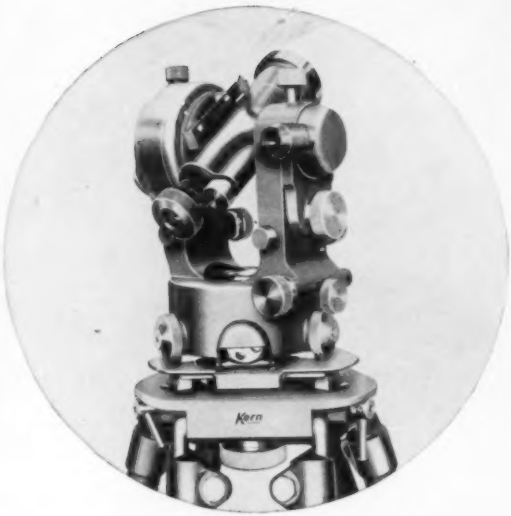

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Introducing the New President of ACSM

LESTER C. HIGBEE, who assumed office as President of the American Congress on Surveying and Mapping at the Fifteenth Annual Meeting, is no stranger to the title of "president." Mr. Higbee has been president of W. & L. E. Gurley, well-known manufacturers of engineering and scientific instruments, since January 1952, when he was elected the fifth president in the company's 110-year history. He joined Gurley in 1915, and was appointed to its board of directors in 1948.

Born in Atlantic City, N. J., Mr. Higbee received the degree of Civil Engineer from Rensselaer Polytechnic Institute in 1912. In World War II, he spent seven years in command of the New York State Guard Forces of the up-state area with the final rank of Brigadier General.

On his introduction at the opening session of the Congress, Mr. Higbee paid well-deserved tribute to Retiring-President Carroll F. Merriam and expressed the wish that he might serve equally well.

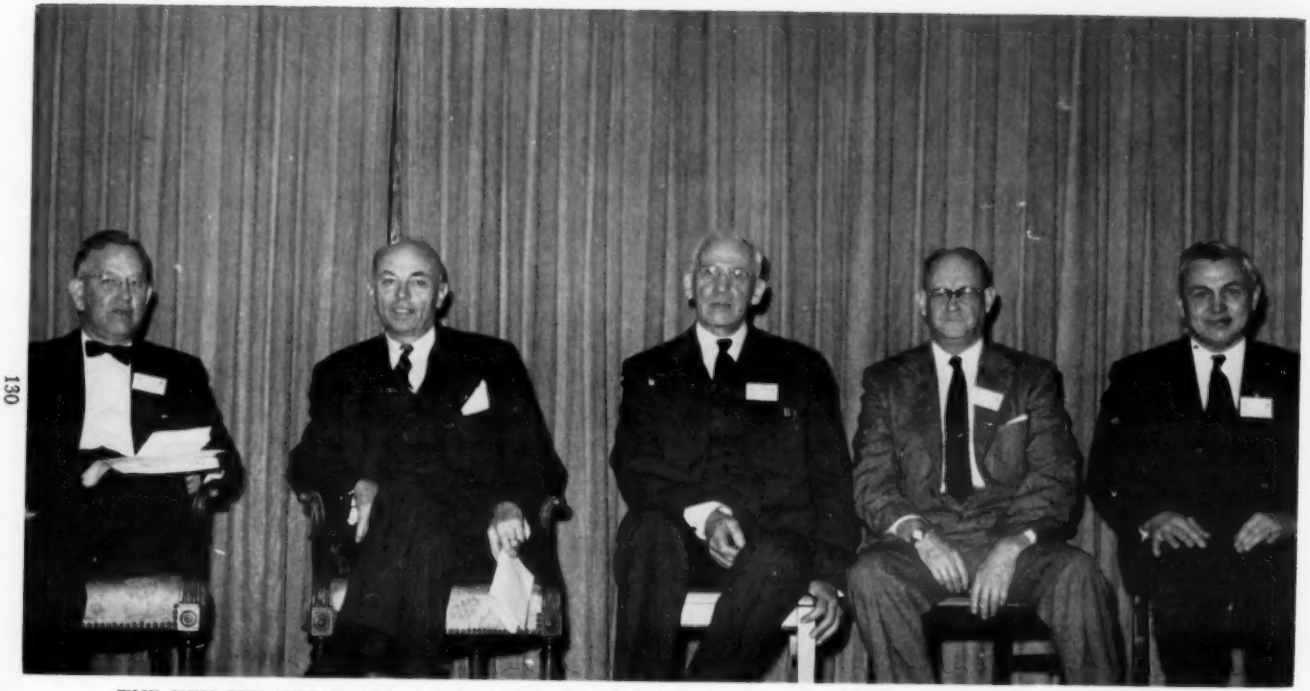
Photo by Fabian Bachrach

PRESIDENT LESTER C. HIGBEE

"In accepting the high office to which you have elected me," Mr. Higbee stated, "I do so with a great deal of pride—a pride based upon the dreams and ambitions of every early American boy, stimulated by parents and grandparents, that he one day may come to Washington as a president—and here I am. But more than that, I take this office with a sober humbleness of thought with regard to its duties and responsibilities and the great need of your help and inspiration in order to continue the magnificent and untiring efforts of those officers who have gone before me.

"Further, in accepting this office I do so with the feeling that due honor is being paid to those who are of professional stature, but who have carried their ambitions and talents into the making of equipment for the needs of professional practice. It is this blending of the professional man, of the educator and of the equipment maker, which, to my mind, has contributed greatly to the success of this organization.

"I have been privileged to serve ACSM in a few things and now I bespeak your continued enthusiasm and inspiration for this larger assignment. We have every evidence that that enthusiasm is growing by leaps and bounds—our increase in membership, the fact that we are a solvent organization, and the fact that we have the local sections coming here and bragging that one is bigger than the other. I am looking to all of you for continued enthusiasm and for inspiration."



THE KEY SPEAKER WITH LEADERS OF ASP AND ACSM AT THE CONSECUTIVE ANNUAL MEETING

Left to right: W. S. Park, President-elect, ASP; Felix E. Wormser, Assistant Secretary of the Interior, who gave the key address; Carroll F. Merriam, Retiring President, ACSM; Gerald FitzGerald, Past President, ACSM, who introduced the key speaker; and Arthur C. Lundahl, Retiring President, ASP.

The Fifteenth Annual Meeting

THE YEAR 1955 will be remembered for the complete success of the Consecutive Meetings and Co-Exhibit of the American Society of Photogrammetry and the American Congress on Surveying and Mapping. The smooth staging of the Annual Meetings of ASP and ACSM as independent but consecutive events was made possible by a fine spirit of cooperation and precise coordination of all operations, plus a good deal of hard work by many members of the two societies.

The American Society of Photogrammetry took over the Shoreham Hotel in Washington, D. C., on March 7, 8, and 9, 1955, for its Twenty-first Annual Meeting. At noon on March 9, the American Congress on Surveying and Mapping moved in for its Fifteenth Annual Meeting, lasting through March 11. There was no lost motion—the exhibitors simply stayed with the same booths and ACSM committees replaced ASP committees in a well-dovetailed transfer. A single registration covered both meetings, thus giving members of either society a fine opportunity to become acquainted with the activities of the other society and to view exhibits that might not have been available at separate meetings.

A record-shattering 1644 members and guests registered for the meetings, including visitors from every quarter of the globe. A large proportion of the registrants, whether members of either or both of the societies, were present for the entire week of activities.

The key speech, delivered by Felix C. Wormser, Assistant Secretary for Minerals Resources, U. S. Department of the Interior, was addressed jointly to both societies. The social functions of the week were likewise held jointly. The technical and plenary sessions were, however, entirely separate, although attendance at all sessions was open to all registrants.

The ASP technical sessions included papers covering a wide range of subjects of interest to ACSM as well as ASP members. Readers of SURVEYING AND MAPPING are referred to forthcoming issues of our excellent sister publication, PHOTOGRAMMETRIC ENGINEERING, for the content of these papers.

The ACSM program included technical papers, panel discussions, division meetings, demonstrations of equipment, and the annual business meeting. As many as possible of the papers and discussions heard at the meeting will appear in this and future issues of SURVEYING AND MAPPING.

Opening of the Congress

Retiring President Carroll F. Merriam opened the Fifteenth Annual Congress on Wednesday afternoon, March 9, following immediately the closing of the 21st Annual Meeting of the American Society of Photogrammetry.

After welcoming the members, Mr. Merriam introduced C. A. Wooldridge, Jr., a newly-elected director, who described ACSM activities in California, now the leading State in number of members.

William C. Wattles, the new Vice President, also from California, extended his greetings. Executive Secretary Walter S. Dix announced the results of the election of ACSM officers as follows:

President—LESTER C. HIGBEE, Troy, N. Y.
Vice Pres.—WILLIAM C. WATTLES, Glendale, Calif.
Directors—CHARLES H. ANDREGG, Bethesda, Md.
FRANK S. BORDEN, Washington, D. C.
ROBERT H. LYDDAN, Arlington, Va.
WM. H. WILSON, Houston, Tex.
CHARLES A. WOOLDRIDGE, JR., Carmel, Calif.

In his greeting to the Fifteenth Annual Congress, President-elect Higbee pointed out the healthy condition of the organization, with a growing membership, solvent finances, and active competition among many local sections. His election, he said, was a welcome recognition of the contribution of equipment manufacturers to the profession, and also satisfied his boyhood ambition to come to Washington as President. If the members continue their active interest and assistance, said Mr. Higbee, ACSM can look forward to another year of progress and usefulness.

The opening program feature was a panel discussion on the topic "Reappraisal of Relationships Between Surveying, Photogrammetry, and Engineering." The discussion covered a complex and controversial field including such subjects as the professional status of surveyors and photogrammetrists, State registration laws and regulations, ethical practices, methods of soliciting work, education and training, and many others. No conclusions were expected,

but many shades of opinion were ably presented and a number of important questions were clarified.

The moderator, Dr. N. W. Dougherty, Dean of Engineering, University of Tennessee, and President, American Society for Engineering Education, began by defining professional work. It is work, he stated, that satisfies a social need; is primarily intellectual, requiring discretion and judgment; is not standardized; and is based on specialized knowledge not known to others. Those doing professional work generally have a strong group consciousness, a code of ethics, and a recognized legal status through licensing. The justification for state regulation of professional occupations and other restrictions imposed, Dean Dougherty declared, is the confidential relationship between the professional man and his clients, and the inability of the average person to judge the value of professional services.

The first panel member, Paul H. Robbins, Executive Director, National Society of Professional Engineers, pointed out the great growth and increasing specialization in the surveying and mapping fields during the past 25 years. Photogrammetry in its broadest sense is a method of surveying, and surveying is a major branch of engineering. Yet many specialized activities within these fields are not professional. Careful distinctions are needed, he emphasized, between professional and other work so that those who deserve professional recognition may obtain it.

The second speaker, Lewis A. Dickerson, Professional Status Committee, American Society of Photogrammetry, reviewed the background of the development of photogrammetry during the last 50 years, pointing out the close relationship to civil engineering. He suggested that on-the-job training of men with limited educational qualifications, brought on by manpower shortages since the start of the last war, now makes professional recognition more difficult.

Leon T. Eliel, President, Fairchild Aerial Surveys, Inc., representing the Association of Professional Photogrammetrists, distinguished between the "master professional" whose work requires superior intuition and judgment and other professionals whose work can be exactly specified in words. The surveyor and photogrammetrist belong in the second category, and some specialties in the field are not professions in the usual sense. Nevertheless, Mr. Eliel expressed his belief that mapping work should be negotiated, not obtained by competitive bidding, because the customer must rely on the integrity of the producer, a quality that does not come with the cheapest price tag.

Michael Baker, Jr., President, the Baker Engineers, and a member of the Pennsylvania State Board of Registration, differed with Mr. Eliel in the matter of competitive bidding for mapping contracts or engineering work. He pointed to the large amounts of money now involved in the engineering phases of public works, sometimes several million dollars in one job, and the opportunity for abuses in negotiated pricing. Mr. Baker stated his opinion that registration laws in some states are used to restrict competition not to protect the public, and that these laws should be reappraised generally to promote healthy growth of the professions. He suggested that engineering societies might review their ethical codes in the light of present-day conditions when personal relationships between engineer and client are no longer possible.

Robert H. Lyddan, Chairman, Executive Committee, Surveying and Mapping Division, American Society of Civil Engineers, described the study now under way by ASCE to determine (1) which phases of activity in surveying and mapping are professional and which nonprofessional; (2) which duties within each phase are on a professional level; and (3) which of the activities or duties should be considered engineering work. A committee made up of Brother Austin Barry, American Society for Engineering Education, Geo. D. Whitmore, U. S. Geological Survey, and A. O. Quinn, Aero Service Corporation, has developed a list of the branches and sub-branches of surveying and mapping. After tentatively classifying each part as to whether it should be considered professional work, and whether it should be considered engineering work, the list will be submitted to a large and representative group of surveyors, photogrammetrists, and engineers. The objective is to arrive at definitions, acceptable to the greatest proportion of those concerned, that will at the same time promote the best interests of the profession and the general public. Mr. Lyddan stated, as his personal opinion, that the surveying and mapping professions should hesitate in divorcing themselves from engineering until there are adequate educational facilities to train men in this work. Otherwise the group risks losing its claim to professional status, simply by definition.

The last panel member, Carroll F. Merriam, Retiring President, ACSM, representing the Professional Status Committee, in summing up, suggested that many of the problems associated

with registration and licensing would seem simpler if we would avoid rationalizing them to our own advantage. The common purpose of all registration laws, he declared, is not the restriction of practice, but the protection of the public. The opposite (and false) view, that registration constitutes a license or permit to do certain types of work, results in more and more borderline disputes as more subdivisions and distinctions are made in the applied sciences. The mere fact that an individual is not registered in this or that field only means that he shall not profess his ability and offer his services to the public. If we fall from this ideal and revert to the practice of registration simply to stifle competition and limit fields for selfish ends, then, said Mr. Merriam, we might as well give up the hope of becoming recognized as a profession.

A lively floor discussion followed with comments and questions from members in the audience. The proceedings of this panel discussion are published in full elsewhere in this issue.

Technical-Division Sessions

Six consecutive sessions of the several technical divisions were held in the same meeting room on Thursday, thereby permitting members to participate in the proceedings of all the divisions. On Friday morning, separate and simultaneous sessions of the technical divisions were held in various meeting rooms. The proceedings of all sessions will be reported as fully as possible in future issues of SURVEYING AND MAPPING.

INSTRUMENTS DIVISION

Chairman Talbert Abrams presided over the meeting of the Instruments Division on Thursday. Secretary C. A. Thorpe presented a report of the previous meeting. Chairman Abrams and Secretary Thorpe were reelected to the same offices for 1955.

Clarence W. Kitchens, Sr., of the Engineer Research and Development Laboratories, Fort Belvoir, Va., presented a paper entitled "Electronic Survey Computer." The paper was preceded by a brief motion picture tracing the development of machines used in computing survey data from the early hand-operated devices to the latest electronic computers. The film showed the intricate "innards" of the complex machine which Mr. Kitchens then explained in his paper, with accompanying slides. Advantages built into the device include the use of the decimal rather than the binary system to permit rapid training of operators; built-in safeguards against errors, both in coding the operating instructions and the survey data that are stored on a magnetic drum and used as needed; and the automatic typing of results in tabular form for reproduction and use. The computations, Mr. Kitchens pointed out, are completed and typed in a few seconds instead of many minutes.

THE ANNUAL MEETING AFFORDS A GRAND OPPORTUNITY FOR RENEWING OLD FRIENDSHIPS. ABOVE, SECRETARY DIX AND AL QUINN TALK OVER OLD TIMES.

Philip Kissam, Professor of Civil Engineering, Princeton University School of Engineering, described recent developments in "Precision Instrument Adjustment for Optical Tooling." Optical tooling is a comparatively recent development in the use of older instruments, and now newly-designed instruments, to aline precisely the jigs and forms used in industry. Professor Kissam pointed out that measurements and alinements accurate within a few thousandths of an inch over a distance of as much as 100 feet are required. Instrument adjustment must therefore be extremely accurate. Professor Kissam outlined the geometric theory pertaining to adjustments that have to do with the line of sight and proposed some refinements to the procedures for adjusting jig transits. The paper is published in full elsewhere in this issue.

CARTOGRAPHY DIVISION

The Cartography Division held two sessions during the Fifteenth Annual Meeting. Joseph P. Dunich, newly-elected Chairman, presided at the Thursday morning session, and introduced the featured speaker, Aaron L. Shalowitz, Assistant to the Director, U. S. Coast and Geodetic Survey. Mr. Shalowitz's detailed and scholarly paper presented the varied and com-

plex "Boundary Problems Associated with the Continental Shelf." Problems of international law as well as technical problems of surveying add to the ramifications of this subject. The paper is published in this issue of SURVEYING AND MAPPING.

The second session, held on Friday morning, was opened by Arthur F. Striker, retiring Chairman, who summarized divisional activities for the past year and announced the election of Joseph P. Dunich, Coast and Geodetic Survey, as Chairman for the year 1955–56, and Seymour Finley, Army Map Service, and Arch C. Gerlach, Library of Congress, as Directors for two-year terms. Mr. Striker then turned the meeting over to Mr. Dunich who introduced the speakers, Col. Richard W. Philbrick, USAF, Commanding Officer, ACIC, St. Louis, Mo., and Otto C. Stoessel, Civilian Chief, ACIC Reproduction Division, Charting Techniques Branch. Speaking on the general subject of "Development of Cartographic and Reproduction Techniques in Chart Production," Colonel Philbrick introduced three technical problems, which had recently been solved by ACIC.

The solutions to these problems, summarized by Mr. Stoessel, involved (*a*) a photo-mechanical method of achieving a vignetted or feathered treatment of graded shades of blue for shoreline emphasis along coasts and for inland water features, (*b*) the Lac-Strip technique of color separation for preparing gradient tints used to indicate elevations on charts; and (*c*) a photo-mechanical solution for adjusting or toning-down contour lines on photo-maps, so they will not obliterate essential information.

PROPERTY SURVEYS DIVISION

The first technical session of the Property Surveys Division, held on Thursday morning with Chairman W. B. Williams presiding, featured a paper by William L. Shoemaker, Maryland State Tax Commission, on "Tax Maps—Economic Value, Preparation, and Use." Mr. Shoemaker described the statewide program of preparing tax maps enacted by the Maryland legislature. The mapping program will include an index of ownership by name, parcel number, and deed reference. The maps are applied to each of three basic operations of assessment agencies: (1) discovery of property, (2) aid in the description of property, and (3) determination of land use and potential value. The project is estimated to cost about $1,000,000, to be amortized in 12 years through resulting savings. The annual cost of keeping the Maryland tax maps on a current basis is estimated at $75,000.

In discussing Mr. Shoemaker's paper, Gordon E. Ainsworth stated that the tax-map program in his home State of Massachusetts is sponsored by individual cities and towns rather than by the State. The work is divided between private surveyors and municipal engineers. Mr. Ainsworth envisioned the tax-map problem in Massachusetts as an important and useful but never-ending task.

Robert McCammon described the great need for tax maps in Vermont which presently has no such maps. Because of this situation, some parcels are undertaxed, some are overtaxed, and some are not taxed at all.

Willfred B. Williams described the Michigan tax-map program which is conducted by counties. Because of the General Land Office setup in Michigan, the situation is different from that of the Eastern States. Tax maps are made up in books, one section to a page, giving owners and code numbers to identify parcels. Correct taxable (but not legal) descriptions of each parcel are included, along with information concerning areas and school districts.

The second session of the Property Surveys Division was held on Friday morning, with Chairman Willfred B. Williams again presiding.

A report was given by William T. Pryor of the Bureau of Public Roads on developments resulting from the adoption of two resolutions at the Fourteenth Annual Meeting (1954); these resolutions provided for (1) the coordination of highway surveys with the established network of ground control surveys, and (2) the preservation of survey monuments already established. Mr. Pryor reported that the resolutions had been transmitted by ACSM to the Commissioner of the Bureau of Public Roads asking for his support of these objectives. The Commissioner indicated his sympathy with the objectives and forwarded a set of the resolutions, through the American Association of State Highway Officials, to each State highway department with an appeal for complete cooperation.

Ralph M. Berry, Chairman of the Nominating Committee, announced the election of the following division officers for 1955:

Chairman—GORDON E. AINSWORTH
Vice Chairman—ROBERT MCCAMMON
Secretary—VICTOR A. GHENT
Assistant Secretary—PAUL R. MCLAGAN
Assistant Secretary—C. A. WOOLDRIDGE, JR.
Associate Editor—RUSSELL C. BRINKER

Victor A. Ghent took the chair for the presentation of the program. A blackboard exposi-

tion entitled "Graphic Analysis of Intersection Method" was presented by John Marshall L.S., P.E., of Virginia. Mr. Marshall answered questions from the floor as he proceeded with the demonstration. The intersection method provides a valuable shortcut in surveying computations.

H. P. Tanner, of Wild Heerbrugg, gave a demonstration and lecture on "The Use of the Subtense Bar." Mr. Tanner explained how the subtense bar is used for determining distances by measuring the angle at one station subtended by a bar of precisely known length at the second station. Some examples of extremely accurate distance measurements by this method were cited. In the ensuing floor discussion, it was pointed out that the apparatus has certain limitations, especially in urban areas, but is very economical under favorable conditions.

A paper on "The Repair of Instruments and the Relationship of the Instrument Repairman to the Surveyor" was read by C. A. Thorpe, of Thorpe-Smith, Inc. Mr. Thorpe cautioned that the surveyor should learn to discriminate between the adjustments and repairs which he can do himself, and those which he should not attempt. A distinction was made between the *qualified repairman* who usually has had engineering training and years of experience in instrument repairs, the *replacement repairman* who may tie up an instrument for a long time while he sends for parts he cannot make himself, and the *cleaning and adjusting man* who may ruin an instrument. The conditions that would indicate that an instrument should be sent in for repairs were enumerated.

Lawrence A. Smith, President of Thorpe-Smith, Inc., presented a demonstration and discussion of the common causes of error in an instrument. Mr. Smith used a conventional transit, broken down into its component parts, to illustrate his presentation.

Mr. Williams, resuming the chair for the closing Property Surveys Division business, introduced Gordon E. Ainsworth, Chairman-elect, to whom the chair was turned over. Mr. Ainsworth reviewed some recent activities of the division and outlined some desirable future activities, especially in the field of backing needed legislation. He stressed the responsibility of each individual in promoting public relations and invited suggestions for improvement of the division's program.

Vernon D. George, of Virginia, presented a personal report on the availability of errors-and-omissions (professional indemnity) insurance. There is an American company, Mr. George stated, that will write a tailor-made group policy for professional indemnity. The policy would be in the name of an organization, such as ACSM, which would hold the policy but have no responsibility; individual certificates would be issued to members. A resolution was passed to appoint a committee to investigate the details of this type of insurance.

The Property Surveys Division expressed itself as being in favor of resolutions thanking the Bureau of Public Roads and the American Association of State Highway Officials for their cooperative action towards preserving monuments and tying-in highway surveys to coordinate systems. Favorable action was also taken on a resolution that State highway organizations be contacted to the fullest extent possible in order to secure their support on action toward the preservation of monuments.

TOPOGRAPHY DIVISION

The first session of the Topography Division was held on Thursday afternoon with Chairman Earle J. Fennell presiding. A paper on "Engineering Topography (Large Scale) by Photogrammetry" was read by Carl J. Alster, Alster & Associates, Washington, D. C. The difficulties of preparing large-scale topography with vertical aerial photography, Mr. Alster stated, are proportional to the scales and contour intervals required. Special problems pertaining to large-scale photogrammetric work include stability of aircraft, image motion, shadows, location of control points, and the high order of accuracy required for control. Flight altitudes for large-scale topographic mapping are largely governed by the horizontal accuracy requirement rather than by the contour plotting tolerance, Mr. Alster declared. In outlining the procedures used in some specific projects recently executed by his company, Mr. Alster emphasized the phases that differed from simple or routine operations.

Lloyd E. Marsden, U. S. Geological Survey, presented a paper on "Shortcomings of Contour Lines." Although contours appear to be the best method of showing ground elevation, Mr. Marsden pointed out, they fail to give a good pictorial representation of the terrain. Such features as low ridges or embankments may be completely missed by the contours. Tops, saddles, and cliffs are inadequately portrayed by the present method of depicting relief by contours. Mr. Marsden presented a number of slides showing suggested methods of portraying, by simple symbols, several types of topographic features that are inadequately shown by con-

tours. The paper is published elsewhere in this issue.

A paper on "Raydist in Hydrography and Surveying" was presented by Charles E. Hastings, Raydist Navigation Corporation, Hampton, Va. The speaker described Raydist as an electronic surveying system in which distances are determined in terms of phase shift. The fundamental principles and latest developments were described briefly. Measurements made over flat arid country under carefully controlled conditions, Mr. Hastings stated, gave accuracies on the order of 1 part in 100,000. Ranges in excess of 250 miles have been obtained with light-weight equipment; ranges of 3,000 miles seem entirely practical with high-powered equipment, Mr. Hastings declared. Successful applications of Raydist to date include hydrographic charting, surveying of large over-water areas and difficult terrain, tracking of high-speed missiles and aircraft, and navigation and positioning services.

The Topography Division met for the second time on Friday morning. Warren F. Haring, of Wallace & Tiernan, Inc., Belleville, N. J., read a paper on "Multiple Base Altimetry." Factors that affect the accuracy of altimetry were outlined by the speaker. The tilt of the plane of equal atmospheric pressure can be determined, Mr. Haring said, if at least three base stations are set up, preferably all at the same low elevation. The three-base method gives higher accuracies which make it applicable for some types of surveying projects at less expense than other methods. The principal cost item for altimetry is the expense of man-hours of travel time, Mr. Haring stated. Thus the means of travel becomes a primary economic consideration.

In a brief Topography Division business session, Milton F. Denault, Chairman of the Nominating Committee, announced election of the following division officers for 1955:

Chairman—George S. Druhot
Directors—Bennett G. Jones
Benjamin H. Munroe, Jr.

Retiring Chairman Fennell thanked the members of the division for their cooperation throughout the year and turned the chair over to Chairman-elect Druhot for some brief remarks.

CONTROL SURVEYS DIVISION

The Control Surveys Division held the first of its two sessions on Thursday afternoon, with Prof. Milton O. Schmidt, Division Chairman, presiding. This session was opened with a paper on "Electronics in Surveying—Distance Measurement by Light," By Dr. Erwin F. Gigas, Director, Institut für Angewandte Geodasie, Frankfurt a. M., Germany. In the absence of Dr. Gigas, the presentation was made by G. Stubbe of the Askania-Werke AG., Berlin-Friedenau. The paper, which was illustrated with slides, described the theory, design, and operation of a newly-developed Electronic Distance Meter (EDM) which is to be used for precision traverse surveying as a replacement for third-order triangulation. The principle employed is based on the measurement of phase difference in a modulated light wave. In operation the instrument at the first station transmits the light to a reflecting mirror at the second station and then measures the phase difference of the returning wave with the aid of a complex electronic installation. The aim appears to be the development of a portable instrument that can accomplish the same results as the Geodimeter when limited to third-order accuracy.

The second paper given at this session was entitled "Accomplishments of the Inter American Geodetic Survey—A Moral of Cooperation Between Twenty Countries," presented by Col. Robert R. Robertson, Director, Inter American Geodetic Survey, Fort Clayton, Canal Zone. Colonel Robertson described the historical development of IAGS and stated that its overall objectives were the mapping of the Americas, the creation of good will among the nations of the Western Hemisphere, and, thus, the fostering of hemispheric solidarity. A number of unusual projects in which IAGS and its personnel have participated were cited. Colonel Robertson indicated the mammoth proportions of the undertaking to survey and map Latin America and the diverse nature of the terrain within the areas of operation. He emphasized the beneficial aspects accruing to the United States through IAGS cooperative programs with almost all of the hemisphere neighbors south of our border.

The Control Surveys Division met for the second time on Friday morning with Prof. Milton O. Schmidt, Chairman of the Division, again presiding. E. D. Morse of Houston, Tex., and Homer C. Fuller, Washington, D. C., Directors of the Division, were introduced.

William T. Laidly, of the U. S. Lake Survey, Detroit, Mich., spoke on "Control Surveys Activities of the U. S. Lake Survey." Mr. Laidly prefaced his remarks with a discussion of the early history of the Lake Survey; he then told of the present functions of that organization

with respect to the establishment of the horizontal and vertical control required for the charting activities in the Great Lakes Basin.

Chairman Schmidt then opened the division business meeting by introducing several of the previous Chairmen of the division as well as J. E. R. Ross, Dominion Geodesist, Geodetic Survey of Canada.

Capt. H. W. Hemple, Chairman of the Nominating Committee, presented the name of Prof. Arthur J. McNair, Head of the Survey Department of the School of Civil Engineering, Cornell University, to serve as a Director of the Control Surveys Division for a three-year term commencing January 1, 1956. There were no other nominations and Professor McNair was elected by the Secretary casting a unanimous ballot.

Professor Schmidt introduced the following committee chairmen:

Membership—ALBERT C. KALBFLEISCH
Public Education—THOMAS L. BRANSFORD
Research and Development—JULIUS L. SPEERT
Technical Standards—WILLIAM T. LAIDLY

The business meeting was followed by a division panel discussion on "Control Surveys as Applied to Engineering Projects." Prof. C. A. Egner of Purdue University served as moderator of this panel and informally developed a group discussion on various questions relating to the special interests of the members of the panel.

E. C. Houdlette, Massachusetts Department of Public Works, told of the work accomplished in Massachusetts during the days of CWA, PWA, etc., and then described the present organization for control surveys, giving special emphasis to the survey requirements for the highway program within his State.

E. D. Morse, Houston Lighting & Power Co., Texas, described the broad requirements of a utility company in acquiring the right-of-way for transmission lines and the procedures for referencing property-survey monuments to the State plane-coordinate systems.

Max O. Laird, American Telephone and Telegraph Co., described some of the operations, giving specifications used, in establishing special installations used in radio communications. Mr. Laird also showed slides to illustrate some of the methods of monumenting stations in marsh areas, and a portable tower and tripod developed for their work.

B. E. Beavin, Civil Engineer and Land Surveyor, Baltimore, Md., emphasized the need for care in monumenting points and also in preserving survey notes and records, so that it would not be necessary to repeat basic surveys in urban areas because of the negligence of those who made earlier surveys.

R. E. Wagstaff, Chairman of the Fairfax-Loudoun County Line Commission, Herndon, Va., traced the development of the county system in Virginia, and described the earlier markings of the Fairfax-Loudoun line, which resulted in considerable confusion. He told of the assistance given by the U. S. Coast and Geodetic Survey in reestablishing this line and the acceptance of the results of this survey by the joint commission.

The interesting and yet informal manner in which the discussions were presented was very appreciatively received by the audience.

EDUCATION DIVISION

Brother B. Austin Barry, F. S. C., Chairman of the Division, presided at the Education Division session on Thursday afternoon. The session included the presentation of two technical papers, each of which was discussed by other division members, and, immediately afterward, a business meeting of the division.

The first paper was "A New Philosophy in Making Measurements," by Prof. Sumner B. Irish of the Civil Engineering Department, Princeton University. The new philosophy which Professor Irish presented emphasized the need for a greater appreciation and a scientific reevaluation of the many factors which can cause error in making the basic surveying measurements with the tape, the transit, and the level. He illustrated his point with numerous examples to show that, oftentimes, only one of the many factors has been considered when statements are made as to the probable error of a survey. Good analytical techniques are required, if surveyors are to understand the significance of their methods, Prof. Irish stated.

In discussing Professor Irish's paper, Prof. Arthur J. McNair of Cornell University reemphasized some of the major points brought out in the paper and described one of the work problems presented to all surveying students at Cornell in an attempt to develop in the students an appreciation of the possible and probable sources of error and their magnitude. Professor McNair requested written comments from the audience as to what education should include in order to turn out students who, 20 years from now, will be in the forefront of surveying education and practice.

The second technical paper was given by Prof. Harmer A. Weeden of Bucknell University, on the controversial subject "Surveying for Non-Civils—What Should It Contain?" Pro-

fessor Weeden described and deplored the continuing tendency toward eliminating surveying as a required course for non-civil engineering students. He attributed the trend to the pressure on engineering-school administrators to make room for humanistic courses or new curricular material in their own fields, and to the failure of civil engineering schools to design the course so that it is fundamental to the disciplines of the other schools. He described what is presently being taught, and presented in outline a non-civil surveying course which would overcome the objections.

Prof. Russell C. Brinker, Head of the Civil Engineering Department, Virginia Polytechnic Institute, in his discussion of Professor Weeden's paper, amplified the program presented by Professor Weeden and outlined additional points pertinent to the problem. He pointed out that many departments other than those of mechanical and electrical engineering have a stake in the problem—citing agricultural engineering, architectural engineering, forestry, geology, aeronautical engineering, and mining—and concluded that the best method of determining what should be given in a non-civil engineering course in surveying is to ask the departments concerned what they want in it—what they think is fundamental to their students.

The second discussion of Professor Weeden's paper was presented by Prof. Philip Kissam of Princeton University who also strongly endorsed the program outlined by Professor Weeden. He explained that the application of surveying methods is the only possible answer to the increasing demand for accuracy in many other engineering fields which has been imposed by the trend toward mass production. Professor Kissam cited, as examples, the problem of construction of huge jigs to the tolerances needed, the problem of accurate alinement of shafts in modern power plants and rollers in steel mills, and the problem of construction of nearly perfect airfoils for modern high-speed aircraft. Professor Kissam stated that, at Princton, the surveying course designed for non-civil engineers was being given, with good success, as a first course—an indoctrination course—for civil engineers as well.

A lively discussion from the floor followed the presentation of the two papers. A. C. Stiefel pointed out that, in considering surveying course content for non-civil engineering students, attention should be given to teaching the value and use of maps. William C. Wattles, Vice President of ACSM, brought out the point that education should not neglect the training of students in the basics of surveying.

At the Education Division business meeting which followed the technical session, Prof. Leo V. Nothstine of Michigan State College was nominated and elected a director of the division. (EDITOR'S NOTE.—The Education Division follows the admirable practice of electing one new director each year for a 3-year period, during the last year of which he serves as Division Chairman. Thus the division is assured of having, as chairman, a member who is completely conversant with all division problems and activities.)

Plenary Session

President-elect Lester C. Higbee presided over the plenary session on Friday afternoon. The first paper of the afternoon was presented by Herman R. Friis, The National Archives, Washington, D. C., on "A Brief History of the Graphic Interpretation of Landscape as Reflected on Large- and Intermediate-Scale Maps of Areas in the United States Prepared by Agencies of the Federal Government Prior to 1880."

Mr. Friis' presentation was colorfully illustrated by an abundance of slides showing rarely seen maps of historical importance, ranging from *A Mapp of Virginia discovered to ye hills*, prepared in 1651, to John Wesley Powell's map of the Green River Region, prepared in the 1870's.

Douglas R. Woodward of the U. S. Geological Survey presented a paper entitled "The Federal Government in the Field of Surveying and Mapping." Mr. Woodward traced the basic authority for and the history of surveying and mapping in the Federal Government, and discussed ways and means for discharging these responsibilities. The carrying out of general-purpose surveying and mapping activities, Mr. Woodward declared, is accepted by all major nations of the world as a proper function of government. A Federal agency responsible for mapping must not only produce the maps; it must also determine standards, the order of accomplishment, and the procedures to be used, and maintain contact with the many users of the product. It must solve problems such as security, safeguarding the welfare of the general public, and civil or military priorities, particularly in a national emergency. One of the most deeply entrenched misconceptions in the public mind, Mr. Woodward added, is that all Government operations are, per se, inefficient. One

healthy sign of the quality of Government operations in photogrammetry and mapping is the successful history of research and development in Government agencies. This paper is published elsewhere in this issue.

In a paper entitled "The Technical and Professional Aspects of the Application of Photogrammetry to Large-Scale Surveying," T. J. Blachut, National Research Council of Canada, outlined some recent European experiences in cadastral surveying by photogrammetry. Experiments conducted in Switzerland, Sweden, and The Netherlands have indicated a 25 to 50 percent saving resulting from the use of photogrammetry. In addition to the money saving, there has been a saving in time required to complete the surveys, primarily because of the reduction of the required control network. Mr. Blachut stated that the more detailed the desired map, the more economical is photogrammetry. He pointed out that photogrammetry is not necessarily the province of only large organizations. Large-scale photogrammetric surveying fits naturally into the scheme of the small surveying firm, using one or two plotters to serve the local environs.

Herbert F. Trager of Zeiss-Aerotopograph, Munich, West Germany, read a paper on "Legal Surveying by Photogrammetric Means—A European Example of Cadastral Surveying Operation." Mr. Trager described a very precise check made during the summer of 1953 to determine the extent to which photogrammetry could be used for conducting cadastral surveys. Special consideration was given to the mean-square-error limits for field work. The results of the experiments were tabulated and shown on a series of slides, indicating a very high degree of accuracy.

Business Meeting

Retiring-president Carroll F. Merriam presided over the annual business meeting on Friday afternoon. (The proceedings are reported in full elsewhere in this issue; only a brief outline is given here.)

Marshall S. Wright, Sr., was nominated to Honorary Life Membership in ACSM, in recognition of his outstanding contributions to the society.

Chairman A. C. Kalbfleisch of the Teller Committee reported the official count in the election of ACSM officers for 1955 (*see* list of officers elected, under "Opening of the Congress").

A statistical report on the membership of ACSM was given by Capt. Frank S. Borden, Chairman of the Membership Committee. Capt. Borden also announced the names of members winning citations for advancing the growth of the society.

Brief reports were given by Morris M. Thompson, Chairman of the Publications Committee, and Robert C. Eller, Editor-in-Chief.

Division reports were given by the following Chairmen (or Chairmen-elect) for the divisions indicated:

Joseph P. Dunich—*Cartography*
Milton O. Schmidt—*Control Surveys*
Brother Austin Barry—*Education*
Willfred B. Williams—*Property Surveys*
George S. Druhot—*Topography*

Local Section reports were given by William C. Wattles for Southern California, Charles A. Wooldridge, Jr., for Northern California, Stanley P. Chapman for Louisiana, and W. H. Wilson for Texas.

In his closing message, Retiring-President Merriam expressed his pleasure at having served as President, and then turned the chair over to incoming President Higbee. A floor discussion of miscellaneous business items followed. President Higbee presented a brief inaugural message and the Fifteenth Congress was formally closed.

Exhibits

The first combined ASP-ACSM exhibit proved to be one of the greatest displays of its kind ever assembled and surpassed any previous exhibit staged at an ACSM meeting. Seventy-six exhibit booths were in operation during the entire week of March 7–11. Extreme interest aroused by the exhibits was evidenced by the large crowds that visited each booth throughout the week.

Prominent domestic and foreign manufacturers made available for inspection the latest surveying, photogrammetric, and scientific instruments, as well as related equipment, materials, and supplies. Private professional and commercial service organizations presented interesting displays of methods, procedures, accomplishments, and available services. Leading Federal mapping agencies sponsored exhibits illustrative of the broad field of surveying, photogrammetry, and cartography.

The colorful exhibits indicated careful planning in construction and presentation. Commercial and government booths alike had representatives present at all times to explain and demonstrate each exhibit. Not to be overlooked

ONE EXHIBITOR USED A SURE-FIRE FORMULA TO CALL ATTENTION TO HIS DISPLAY.

was the free coffee served on the Bird Cage Walk by Gordon Enterprises which added to the congenial atmosphere.

Members of the joint Exhibits Committee deserve high praise for their excellent coordination of the combined exhibit. The availability of an exhibit directory and the establishment of an Exhibits Information Desk contributed greatly to the overall success of the program.

Commercial exhibitors participating in the 1955 ASP-ACSM combined exhibit were as follows:

Abrams Aerial Survey Corp., Lansing, Mich.
Abrams Instrument Corp., Lansing, Mich.
Aero Service Corp., Philadelphia, Pa.
Air Survey Corp., Arlington, Va.
Ansco Division, Gen. Aniline and Film Corp., Binghamton, N. Y.
Bathey Manufacturing Co., Plymouth, Mich.
Bausch and Lomb Optical Co., Rochester, N. Y.
C. L. Berger and Sons, Inc., Boston, Mass.
Charles Bruning Co., Inc., Chicago, Ill.
Chicago Aerial Industries, Inc., Chicago, Ill.
Cooper-Trent, Washington, D. C.
Eugene Dietzgen Co., Chicago, Ill.
Direct Reproduction Corp., Brooklyn, N. Y.
E. I. duPont de Nemours and Co., Inc., Wilmington, Del.
Eastman Kodak Co., Rochester, N. Y.
Fairchild Aerial Surveys, Inc., Los Angeles, Calif.
Fairchild Camera and Instrument Corp., Syosset, N. Y.
Fennel Instrument Corp. of America, Long Island City, N. Y.
Oscar Fisher Co., Inc., Peekskill, N. Y.
Geo-Optic Co., Inc., New York, N. Y.
Gordon Enterprises, North Hollywood, Calif.
Grant Photo Products, Inc., Cleveland, Ohio
W. and L. E. Gurley, Troy, N. Y.
Hunting Group of Air Survey Companies, London, England.
Hycon Manufacturing Co., Pasadena, Calif.
Instruments Corp., Baltimore, Md.
Kelsh Instrument Co., Inc., Baltimore, Md.
Kern Instruments, Inc., White Plains, N. Y.
Keuffel and Esser Co., Hoboken, N. J.
LogEtronics, Inc., Washington, D. C.
Lufkin Rule Co., Saginaw, Mich.—New York, N. Y.
Don A. Moler Distributors, Washington, D. C.
Monroe Calculating Machine Co., Inc., Orange, N. J.
Monsen, Chicago—Los Angeles—Washington, D. C.
Geo. F. Muth Co., Washington, D. C.
Photogrammetry, Inc., Silver Spring, Md.
Raydist Navigation Corp., Hampton, Va.
J. G. Saltzman, Inc., New York, N. Y.
Union Instrument Co., Plainfield, N. J.
Universal Instrument Co., Brentwood, Md.
V. and E. Manufacturing Co., Pasadena, Calif.

WALLACE AND TIERNAN, INC., Belleville, N. J.
DAVID WHITE CO., Milwaukee, Wis.
WILD HEERBRUGG INSTRUMENTS, INC., Port Washington, N. Y.
ZEISS AEROTOPOGRAPH, Munich, Germany

Representing the Federal Government were mapping agencies of the Departments of Interior, Air Force, Agriculture, Army, Commerce, and Navy. Interesting exhibits were also displayed by the National Geographic Society, American Geographical Society, Library of Congress, National Archives, International Resources Exploration Group, and the District of Columbia Chapter of the Special Libraries Association.

Social Activities, Ladies' Program

(EDITOR'S NOTE.—We are indebted to Mrs. Frank S. Borden for this report on social activities.)

The success of the consecutive meetings of ASP-ACSM extended to the enjoyment of the entertainment program planned for members and their wives. About four hundred, a large number of them out-of-town members, enjoyed the cocktail party given Monday evening in the Terrace Banquet Room. There, old friends met and new friendships were formed, giving further get-togethers an informal and congenial background. The music furnished for dancing enhanced the festivity of the affair.

Tuesday, opportunity was afforded for the ladies to visit The National Cathedral and tour this shrine of Gothic art and religious significance, the fame of which has spread afar.

While echoes of the past were observed in the stately cathedral, the present was happily portrayed at the Fashion Show Luncheon on Wednesday held at the Sheraton Park Hotel, adjacent to The Shoreham, headquarters for the societies. Many of the ladies took this opportunity of viewing the parade of spring and summer styles currently available in some of the Washington stores. This display doubtless stimulated later shopping trips.

Wednesday evening featured the Annual Dinner which drew the largest attendance of any in the history of such events. Four hundred and sixty-five diners were assisted in finding their places by a committee of gracious hostesses. They enjoyed not only an excellent dinner but a variety of clever and unusual acts, including dances, vocal music, and loudly applauded audience participation. An act presenting two young girls in juggling and balancing attracted special attention. A background of orchestral music throughout the evening added to the gala atmosphere.

Thursday afternoon the ladies had a special treat in being guests of the Thailand Embassy at tea. They toured the formal rooms, attracted by the interesting examples of native art and original flower arrangements. The attractive tea table held very ample refreshments while tea and coffee were served by young Thai ladies in their native costumes. Later the guests were entertained by native dancing performed by a graceful Thai couple. Color motion pictures of interesting cities and events in Thailand were then shown and explained. As the guests left the embassy with expressions of appreciation, each was presented with an attractive brochure

A GROUP OF MEMBERS AND THEIR LADIES RELAX AT ONE OF THE ENJOYABLE SOCIAL FUNCTIONS.

THIS SMILING GROUP OF HARD WORKERS, ALONG WITH NUMEROUS COWORKERS, POOLED THEIR EFFORTS IN THE SERIOUS BUSINESS OF ORGANIZING AND CONDUCTING THE ASP-ACSM CONSECUTIVE ANNUAL MEETINGS: (LEFT TO RIGHT, STANDING), MARSHALL S. WRIGHT, FRANKLIN WILLIAMS, THOMAS HUGHES, LOUISE HART, LILLIAN THOMA, WILLIAM A. RADLINSKI, CARROLL CAMPBELL, WALTER DIX, JOHN CAIN, HOWARD S. RAPPLEYE, MARGARET PALMER, L. RAY SMART. (LEFT TO RIGHT, SEATED), VIRGINIA WEIR, MARTHA OTT, RUTH FINK, SHEPPARD BARKER.

containing photographs and descriptions of some of the highlights in this colorful country.

Thursday, plans were made for the ladies to attend the annual spring Flower and Garden Show held in the National Guard Armory. Busses carried them from The Shoreham to this beautiful display. Mrs. Ralph Berry, the very efficient and gracious chairman in charge of these activities for the ladies, was responsible for one of the larger exhibits in the show, and was able to obtain the privilege of an early entrance for the group so that they could view the details of color and arrangement before the doors were opened to the general public.

Whereas the opening cocktail party on Monday evening was attended by a preponderance of out-of-town guests, the well-patronized dance on Friday evening brought out more Washingtonians since many of the visitors had left at the conclusion of the meetings on Friday. The dance was a gay event with about five hundred in attendance. The music was good and door prizes were a feature.

Altogether, social-wise, this series of meetings brought out an increasing interest in such events as people become better acquainted through annual contact, and each year some visiting wife expresses the sentiment of the ladies when she remarks, "I am surely going to see to it that my husband comes again next year, *and brings me along!*"

Tribute to the Workers

Many hands participated in the formidable amount of behind-the-scenes effort that contributed so much to the success of the consecutive meetings. The smooth functioning of the coordinated events could not have happened without the friendly cooperation of ACSM and ASP representatives and General Coordinator Marshall S. Wright. ACSM's Chairman Walter S. Dix and Vice Chairman Franklin G. Williams meshed their operations perfectly with those of their opposite numbers in ASP—John W. Cain and William A. Radlinski.

Many others, both members and non-members of formally appointed committees, contributed in various ways to making the consecutive meetings a memorable event. The American Congress on Surveying and Mapping is indebted to all these people who so willingly gave of their time and effort to ensure the success of this unusual undertaking.

—MORRIS M. THOMPSON

Photo courtesy F. H. McGraw & Company

BERGER INSTRUMENTS team-up with F. H. McGraw & Company on billion-dollar atomic energy project...

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ENGINEERING AND SURVEYING INSTRUMENTS...SINCE 1871

The Federal Government in the Field of Surveying and Mapping

By DOUGLAS R. WOODWARD
U. S. GEOLOGICAL SURVEY

THIS PAPER is intended to present some timely views on the subject of the responsibilities of the Federal Government in the field of surveying and mapping. In the time permitted, it can only be a generalized treatment of the whole problem.

This brief study will attempt to cover quickly the basic authority for, and the history of, surveying and mapping in our Federal Government and, finally, will discuss some of the ways and means for discharging those responsibilities. Many of the latter points are subject to differing opinions.

BASIC AUTHORITY

In our United States there is one fundamental authority for all functions of the Federal Government. It is the Constitution of the United States. We all subscribe to the basic concept that all our laws must be consistent with that document.

In the Preamble of the Constitution we find the purposes of the Federal Government clearly and concisely spelled out. Perhaps a quote would be appropriate. It reads as follows:

> We, the people of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity do ordain and establish this Constitution for the United States of America.

Section 8 of Article I of the Constitution also provides specific authority regarding certain functions, including authority to collect taxes to support them.

The Congress has authority to pass laws to carry out the objectives of our Government. It determines what functions are to be carried out and in what amount. The matter of how much money shall be spent is a very important point to all of us. During the history of our country we have seen material change in the interpretation of what constitutes the general welfare of the Nation.

Congress has passed many laws providing specifically for such functions as surveying the public domain, charting coastal waters, exploratory surveys, boundary surveys, geological surveys, topographic surveys, and many other similar functions. These laws set forth, in differing degrees of clarity, specific functions which the Federal Government has accepted as its responsibility in the field under discussion. Many surveying and mapping functions, however, are only indirectly authorized by legislation. For example, what I shall refer to as incidental functions (those subsidiary or incidental to an authorized function) have developed through administrative interpretation of what needs to be done to achieve a particular goal.

Perhaps we could classify mapping activities of the Armed Services in this class. Certainly we could do so with the surveying and mapping activities of the Bureau of Reclamation, the Forest Service, the Soil Conservation Service, and the Tennessee Valley Authority, as well as many other agencies.

I have attempted to determine the relative amount of these incidental or special-purpose surveying and mapping activities but without much success. It is probable, however, that in the aggregate they surpass in dollar volume those which are directly identified as surveying and mapping functions.

One other point regarding responsibility for these functions is rather pertinent. A

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Publication approved by the Director, U. S. Geological Survey.

basic theory of the Federal Government is that the Federal Government should do only those things which cannot be done as appropriately or at all by some lesser level of government or even by individuals themselves. The carrying out of general-purpose surveying and mapping activities is accepted by all major nations of the world as a proper function of government in relation to this criterion.

BRIEF HISTORY OF THE DEVELOPMENT OF SURVEYING AND MAPPING IN THE FEDERAL GOVERNMENT

Perhaps it should be a point of pride to us all that the first President of the United States was in his younger days a surveyor of no mean sorts. Many of his surveying jobs related to boundary and land surveys. As Commander-in-Chief of the American Forces, he directed that topographic route surveys be made for the Continental Army. This marks the beginning of what is now the Corps of Engineers.

Many of the early functions of our Federal Government in the surveying and mapping field relate to problems of land surveys and boundary delineation. In 1785 the township and range system was established by ordinance (this was before the adoption of the Constitution, hence the ordinance). The execution of this work eventually led to the formation of the General Land Office, a predecessor agency of the Bureau of Land Management. The inadequacy of these surveys and plats as general-purpose surveys and maps became obvious after a few decades, and today the principal general-purpose surveys of the Federal Government are embodied in the national series of topographic quadrangle maps.

In 1807 the surveys of the coastal areas to provide charts for navigation were authorized. This was handled under the Coast Survey which with added responsibilities, particularly geodetic control surveys and aeronautical charts, has become what we now know as the Coast and Geodetic Survey.

In 1841 Congress provided for a Hydrographical Survey of the northern and northwestern lakes. This later became the U. S. Lake Survey Office under the Chief of Engineers, U. S. Army.

One of the earliest exploratory surveys under the new Republic was the Lewis and Clark expedition to the Oregon coast in 1804–06. Incidentally, I can recommend highly the interesting reports of that journey. There were many similar exploratory surveys during the nineteenth century, many of which were under the direction of the U. S. Army. The names of Pike, Long, Fremont, Bonneville, and Stansbury are indeed but a few among a host of adventurous and stout-hearted explorers who charted our western frontier. These expeditions were primarily concerned with determining routes for the settlers who followed, or for military operations.

In 1830 what is now the Hydrographic Office of the United States Navy was organized to provide charts and information for our Navy and mariners, particularly in foreign waters.

During the 1850's a survey for the Pacific Railroad was carried out, and a survey of the United States-Mexico boundary was authorized.

Following the Civil War, several separate, and sometimes competing, geographical surveys were authorized. Of particular note were the surveys headed by Wheeler, Hayden, King, and Powell, which were concerned primarily with obtaining topographic and geologic maps of western United States. Finally, Congress, upon recommendation of the National Academy of Sciences,[1] combined these to form the United States Geological Survey in 1879. Surveying and mapping, therefore, has always been a major activity of the Survey.

As I mentioned earlier, many Federal agencies have developed substantial surveying or mapping program to support their primary functions. I think you will agree that such activities cannot be considered primary mapping or surveying functions, yet wherever possible their results should be made available to the public and should contribute to the overall completion of our standard series of maps and surveys. This

[1] H. R. Misc. Doc. No. 5, December 3, 1878.

requires a lot of coordination. Consideration has been given, from time to time, to a regrouping of this work under the primary mapping agencies.

The widespread mapping functions of the Federal Government have been frequently studied and evaluated. In 1941 Robert H. Randall[2] accounted for some 17 reviews or studies of the problem. It is interesting to note that all of these studies endorsed the surveying and mapping activities as proper functions of the Federal Government. Coordination of these functions by the Bureau of the Budget through Mr. Randall has resulted in close control of the programs of the several mapmaking agencies. Up to the present time, at least, such coordination has been a workable substitute for a single surveying and mapping agency.

We must conclude that Congress and the public as well are generally convinced that Federal surveying and mapping activities are necessary and desirable. The Congress continues, by yearly appropriations, to approve and control these functions, and this is pretty good verification of the desires of Congress. It remains largely an Executive Branch problem as to how these functions shall be carried out.

HOW SHALL THESE FUNCTIONS BE PERFORMED?

In studying this general problem, one inevitably gets involved in the problems of how these surveying and mapping functions should be carried out. This, I suspect, is of more interest to many of you than the theory of how Government functions are authorized or the history of what has been done.

Whenever a function is authorized, there must be some agency charged with the full-time responsibility for that function. Perhaps a new agency should be established for the purpose or it may be added to the duties of an existing agency. The latter course is currently a strong tendency in Government.

The responsible agency must do many things in addition to actual production of surveys or maps. It must determine standards, the order of accomplishment; determine and prescribe procedures; maintain contact with the many users of the product, including States; arrange for continued budgetary and other support; maintain relations with many sister agencies; and answer many inquiries from the public. All of these are necessary, and some are peculiar to government. The activities now performed by the Map Information Office and the Board on Geographic Names are examples of special services peculiar to government.

The next question to be answered is "By what means shall the productive operations be carried out?" This is a very complex question involving many points. Such things as security, safeguarding the welfare of the general public, flexibility of control, availability of eligible contractors, availability of persons skilled in the operation, need for improvement in skills and techniques, and the availability to meet civil or military priorities, particularly in a national emergency as determined by the Federal Government, are a few problems to be considered.

The unit having responsibility usually has several alternatives in how the job may be done. It must weigh all of the pertinent factors and decide which of several methods available is the best one. The following discussion outlines the more common methods.

The work may be done with the agency's own staff, recruited, trained, equipped, and maintained for the purpose. In the field of surveying and mapping this is a customary procedure and it has many time-tested advantages. Close control of planning and operations provides a flexibility of programing that is necessary, especially in times of national emergency. It insures continued research in techniques and methods, resulting in economy. Perhaps most important, as a Government agency, it is required at all times to safeguard the general public interest.

It may arrange with another Government agency to do the work. This method

[2] Report of first meeting, American Congress on Surveying and Mapping, June 1941.

is used frequently in fluctuating or nonrecurring jobs and where the skills and capacity are already available within Government. As a matter of fact, a substantial part of the Federal Government's surveying and mapping activities have been financed and carried on under this arrangement.

It may use competitive bidding with private contractors. This procedure certainly is not new to the Federal Government. The work of the early Land Office was carried on in this manner for nearly a hundred years. Intermittently for a great many years, contracts have been let through competitive bidding for various surveying and mapping operations. This includes aerial photography, which for the most part is accomplished under contract by private firms. World War II saw perhaps the greatest expansion of contract work in the field of surveying and mapping. This was necessary because the Federal agencies responsible for the work had not been staffed or equipped to meet all the requirements of the emergency. On the basis of experience, detailed and exacting specifications have been found necessary to make contracting successful. It is also necessary that adequate inspection be maintained by the Federal Government to insure compliance with specifications. It is generally conceded that competitive bidding is appropriate for engineering services that are not professional in nature. Many engineering jobs, and this is true in the field of surveying and mapping, can be broken down so that the professional and subprofessional phases can be segregated, thus permitting two different types of contracting. Furthermore, in the case of surveying and mapping contracts awarded by the mapping agencies of the Federal Government, the usual relationship of professional practitioner to client does not apply, as in most of these contracts the client is fully as capable professionally as the contractor—in many cases more so.

The agency may, under some conditions, use noncompetitive bidding. This method is generally regarded as appropriate for obtaining professional services or where there are unusual circumstances such as to render competitive bidding inappropriate; for example, when there are insufficient qualified bidders to obtain truly competitive bidding.

However, competitive bidding for contract surveying and mapping has been so well established for so many years that it is now, under normal conditions, accepted practice in the Federal Government.

Joint financing is used in cases where more than one unit or level of government has responsibility and interest. One unit may contribute financial support to another.

This method, approved by Congress, has long been used by the Geological Survey and the States to jointly finance and expedite preparation of the National Topographic Map Series.

All of these methods have been or are being used, singly or in combination, by the Federal mapping agencies. Although for the most part they have been specifically approved by Congress, the Department or Bureau head is wisely given considerable latitude in conducting his responsibility in the public interest.

One of the most deeply entrenched misconceptions in the public mind is that all Government operations are, *per se*, inefficient. It is generally believed that Government operations do not have a competitive environment. Certainly the profit incentive is lacking in Government. However, competition for dollars, for manpower, and even for jurisdiction are commonplace in Government service. Furthermore, all Government operations are subject to careful scrutiny from many sources, both within and without Government. One healthy sign of the quality of Government operations is the successful history of research and development in Government agencies. This is particularly true in regard to the fields of photogrammetry and mapping.

I am sure you all have indulged in the American right to criticize Government operations. I have. Government operations must be able to stand up to fair and objective scrutiny because, as most of you know, they get a great deal of attention both from Congress and from the public.

Returning again to the methods used for

getting Government's business done, many functions are best performed by Government forces. Striking examples of this kind are the armed forces of the Nation. We long ago gave up the idea of mercenary troops. Where broad general service is rendered on a continuing basis, "force account" is an especially good method. Where controls or security are essential to the national interest or where standby capacity is vital to national defense, the force-account method is necessary.

SUMMARY

1. The Federal Government has important and well recognized primary responsibilities in the field of surveying and mapping. In addition, widespread incidental surveying and mapping activities are performed in connection with other programs, especially in the public works field. The results of these functions are public property and should be available for public use.

2. Surveying and mapping in the Federal Government by various agencies has been studied and restudied and has been found by impartial groups to be necessary and desirable in the United States, as it is in every other major nation of the world.

3. The methods of getting the work done are, and probably for a long time to come will continue to be, determined by the responsible administrative official of Government qualified by training and experience and authorized by Congress to make such decisions.

4. As our land becomes more valuable and the use and conservation of our resources more important, the surveying and mapping functions of the Federal Government will increase.

5. When excessive peak loads must be handled or in times of a national emergency, specialized commercial mapping industry will be called upon to assist the Federal Government in preparing the maps or charts needed for national defense.

In closing, I should like to add one further comment. This meeting brings together representatives of all organizations, both commercial and governmental, who are interested in the profession of surveying and mapping. I have discussed in a small way the place of the Federal Government in the much larger problem of the entire profession. Although the Federal Government has important responsibilities in this field, there are equally important ones in the commercial field and other levels of government.

These meetings provide an excellent opportunity to exchange ideas and to discuss our common problems. In the United States we feel this is the best way in which to go forward together to give greater service to our country.

* * *

Research Labs Tapping Know-How of Soldier-Scientists

THE Army is utilizing the engineering "know-how" of more than 100 enlisted men at the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va., and it is paying dividends to all concerned.

Graduates of colleges and universities throughout the country, the soldier-scientists are working with civilian engineers in an effort to produce the best possible engineering equipment in the world for our Armed Forces. Assigned to the Laboratories after completing basic training, they hold important jobs ranging from project engineers to nucleonic specialists.

A continuous training program is underway at ERDL to develop this tremendous potential. A 28-session-per-year program teaches the group to do their jobs more efficiently, economically, and with greater insight. Twice a month, several of them are called upon to discuss their projects before the entire group. They do this by using visual aids or conducting actual demonstrations of equipment they are developing. This and talks by key personnel help the group gain an overall picture of the research being conducted at ERDL in over 20 major fields. Results to date indicate that the program has paid off in many respects, the most important probably being in relieving the critical shortage of hard-to-get engineers.

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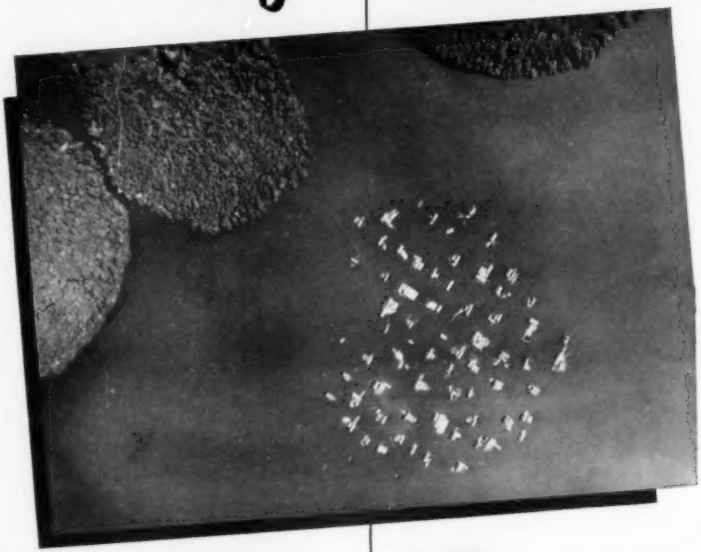

Officials of this small South American fishing village face few of the problems of a modern city or urban county in the United States.

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Reappraisal of Relationships Between Surveying, Photogrammetry, and Engineering

(*A Panel Discussion*)

EDITOR'S NOTE.—The panel discussion and forum presented below constituted the program feature of the opening session of the Fifteenth Annual Meeting of ACSM. The panel was composed of the following members:

Dr. N. W. Dougherty, *Moderator,* Dean of Engineering, University of Tennessee; President, American Society for Engineering Education

Paul H. Robbins, Executive Director, National Society of Professional Engineers

Lewis A. Dickerson, Chairman, Professional Status Committee, American Society of Photogrammetry

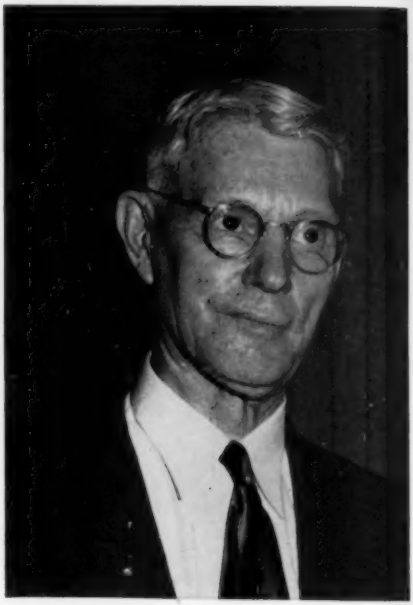
Leon T. Eliel, Vice-President, Fairchild Aerial Surveys, Inc., representing the Association of Professional Photogrammetrists

Michael Baker, Jr., President, the Baker Engineers; Member, Pennsylvania State Board of Registration

Robert H. Lyddan, Chairman, Executive Committee, Surveying and Mapping Division, American Society of Civil Engineers

Carroll F. Merriam, retiring President, American Congress on Surveying and Mapping, representing Professional Status Committee

For economy of space, it has been necessary to condense this feature somewhat, but every effort has been made to retain all of the major points presented.



THE MODERATOR: DEAN N. W. DOUGHERTY

MODERATOR DOUGHERTY: We will talk a little this afternoon about many topics. Our general theme is the reappraisal of the relations between surveying and photogrammetry and engineering. I want to say just a few words in preparation for the panel about professionalism.

I have listed a half dozen or more things that we may claim to be professional. According to the Committee on Professional Recognition of the Engineering Council for Professional Development, of which I happened to be a member some years ago, a profession itself must satisfy an indispensable social need. Its work must require the exercise of discretion and judgment; and that distinguishes us from the people who do routines. It is not subject to standardization. It is an activity conducted on a high intellectual plane. It is an intellectual activity rather than a skilled activity or a manual activity. A profession must have group consciousness, and I think that is true of all the phases of engineering. Maybe it is too true that we join ourselves into many, many splinter groups. And then it should have legal status. Those are the things that identify a profession.

Professionals—and each of us, as individuals, can apply it to ourselves—must have a service motive. They must have, and recognize the obligation to society by living up to, a code of ethics—and all professions have codes of ethics. They must assume the relation of confidence. Professionals are people who have peculiar knowledge, and

the person who is going to use their knowledge does not know whether or not they are using it correctly, so they themselves must determine what they are doing for the individual and do it right, and carry their

Those two criteria, it seems to me, point to whether or not a person falls into the group. If the answer is in the affirmative in both of these, then we are all professionals.

In one State at least, a surveyor's license

PANEL ON "REAPPRAISAL OF RELATIONSHIPS BETWEEN SURVEYING, PHOTOGRAMMETRY, AND ENGINEERING"

Left to right: Paul H. Robbins; Lewis A. Dickerson; Leon T. Eliel; Michael Baker, Jr.; Robert H. Lyddan; and Carroll F. Merriam.

part of the responsibility of advancing professional knowledge, ideals, and practice.

There is a kinship in all professionals. I say there is a kinship in law and medicine and engineering, surveying, photogrammetry, and all the fields of professional activity. All have a relation of confidence, all have a service motive, all have a peculiar kind of knowledge so that they, and they alone, can determine whether or not they are doing satisfactory work.

The professions may be growing apart, but I like to think that they are growing closer and closer together as time goes on. If engineering were not broken up into a large number of specialties, there would be no discussion. The trend in some of the States has been to consider engineering as a series of specialties, and we have licensed them as a series of specialties—mechanical, electrical, civil, chemical, and so on down the list. In other States we list them as engineers only.

The branches, if they are to be part of the same general group, certainly must satisfy two conditions: First, is the activity conducted on a high intellectual plane? If it is routine, if it is manual, if it is a skill rather than an intellectual activity, then it is not a profession; but, if it has those intellectual characteristics, it is a profession. Second, does the practitioner take individual responsibility and does he respect the relation of confidence?

law was declared unconstitutional because the public health and public safety were not involved. Most of the States having such a law say that it is in the interest of the general public and in the public welfare.

With these general remarks I want to introduce the panel members and then we will undertake our discussion.

(At this point, the Moderator introduced the panel members and then called on Mr. Robbins to present the first paper.)

PAUL ROBBINS STATES THE PROBLEMS

MR. ROBBINS: As the Dean has so clearly pointed out, our subject, that of professionalism, is directed toward reappraisal of surveying, photogrammetry, and engineering. When I first began to talk to some of the members of the panel, I had a feeling that we were assuming distinctions, that we were assuming there were differences, between surveying, photogrammetry, and engineering. Those very distinctions, while evident and apparent, I would hope we would not emphasize so much as we would some of the similarities; and yet those distinctions, until and if and when we deny them, present certain problems.

We recognize photogrammetry basically as a means of surveying, although as the field is expanding we are getting out into a great many other activities which are broader concepts of surveying than the definitions we have held in the past; but as

engineers we must consider definitions. When we start to consider definitions in these three fields in order to appraise the relationships, we begin to find that we have problems.

Let us take photogrammetry, for example. In the American Society of Photogrammetry we have a vast number of people interested in the field of photogrammetry. All are not engineers. All are not professional people. Yet, as a society, we are interested in establishing a status of professionalism for those so qualified.

I know you will recognize the people about whom I am talking. We have the gamut from those who take pictures to those who make instruments or those who delve into the highest theory of mathematics. Obviously, somewhere in that gamut there is a professional group, as defined so well by the Dean in his introductory remarks. In addition, we have those associated and vitally concerned with the subject.

Definitions are extremely important. When we move over into the field of surveying we have the same basic problem. Vitally concerned with surveying are those who clear the line. We have the rodmen, chainmen, instrumentmen, and so on. We have those who make the finished map and those who go into all the theories of the vast scope which surveying now encompasses. Again we have the problem of drawing a line above which are professional people and below which are those who are vitally interested but concerned only with technical skills.

Engineering has the same problem, of course. There is an overlap, again, because there are many very competent engineers in the field of photogrammetry and in the field of surveying. I think all in engineering recognize surveying as a major branch of the profession. Those who are concerned with it certainly are very vitally concerned with attaining a professional condition within all these three elements of the engineering profession.

The progress we have made in the last few years really is amazing. Think back, if you will, as short a time as twenty years ago. The scope of photogrammetry was very limited. It was a study, to a large degree, although there were a few practitioners and it was beginning to come into flower. But think of it today. Think of the scope of surveying where, as short a time ago as twenty-five years, the principal activities of surveying were in a relatively confined area. Now, as the world has shrunk and our transportation has moved us out into vast realms, surveying is worldwide.

We have to think of it in terms of entirely different concepts than we did before. So, not only do we have to consider the definition of the people who work in the fields, but we have to consider the definition of exactly the field we are talking about. I know that you are all familiar with the fact that there are studies going on now in all of our societies directed toward these definitions.

It seems to me that the first problem we have in reappraising the distinctions or relationships among the three phases that we are discussing today is the problem of definition. Now, in each of these fields we have a high degree of specialization; we have specialists who are very much concerned with the development of the field, who are becoming, more and more, authorities in a particular phase of the operation. The question, of course, immediately arises as to who is a specialist in terms of work and handwork and who is the specialist in terms of professional activity. Certainly we would be loath to say that the man who is an expert photographer and knows the value of clear, accurate pictures for photogrammetry is not a specialist. There might be some question in the minds of some that he is a professional in terms of what we like to think of as a professional—in terms of our profession of engineering, photogrammetry, or surveying.

A very pressing problem that has been edging into the surveying field is the problem of collective bargaining for some of our professional people. We have the problem of surveying registration as opposed to engineering registration, the problem of who in registration is qualified to do certain types of work. We have the problem of

ethics within our fields—ethics of engineering, ethics of surveying, and ethics of photogrammetry—and who establishes them and who polices them. We have the problem, within our three groups, of their correlation; certainly the premise of these meetings is doing much to facilitate that activity.

We like to think of professional status as something we can probably do something about. I have a feeling that we have to earn professional status; it isn't something that accrues upon ourselves. Its nature isn't such that we can sit here in the room and proclaim to the loud-speaker and to the recorder, "Yes, we have it," and it is automatically bestowed upon us.

Professional status is something that three other groups bestow upon us: the public at large, as they think of us; our associates as they recognize our competence; and those who use our services. It is in these three fields that we have much to do. Certainly in the public as a whole we have a great problem. These fields of surveying and photogrammetry and engineering, by their very nature, are the kinds of things that don't come in contact with the average citizen. We are different from the professions of law, medicine, and others which have a client-personal relationship with the members of the public. So we have to work and find ways and means by which we can bring to the attention of the public some of these things with which we are so familiar.

Likewise, we have to establish and abide by codes of ethics. I wish we had time for the Dean to give us his very excellent talk on codes, and some of their history and applications which have come down through the years, and how we as professional people have a very deep responsibility in that phase. I am wondering if we, as surveying people and as photogrammetrists and as engineers, have gone as far as we could in that direction.

Then we have the very vital problem with the users of engineering services, or of surveying services, or photogrammetric services—pressing problems that we are all too familiar with—the problem of their feeling that they can buy these services as they would nuts and bolts instead of negotiating for them on a professional level.

Some of those things are very pertinent problems with which we must concern ourselves. Maybe we as a group need a bit of public relations. Public relations has tremendous influence upon our lives.

As a group and as a profession, we have a very deep responsibility to acquaint those whom we want to accord us the status we wish with the kind of services we render and the kind of treatment we ourselves expect, and we have a deep responsibility within our own profession to see that we live up to the standards so that we merit the status we think we are entitled to.

LEWIS DICKERSON EMPHASIZES ROLE OF CIVIL ENGINEERS

MR. DICKERSON: I learned in talking with Walter Dix last evening that I would be representing myself here. In spite of that, the program indicates that I am here in the guise of the Professional Status Committee of the American Society of Photogrammetry. I would like to make just two brief points in connection with that. First, the American Society of Photogrammetry is not a professional society. Nevertheless, many professional matters have been of concern within the society for a number of years. The result is that, for about the past four years, the ASP has had a professional status committee to look after the interests of those that have been concerned with such matters.

The American Society of Photogrammetry is really a technical society, as differentiated from a professional society, and I think that if we would examine the Society and what it has taken to put it together we would find that, in measuring it up as a professional society, quite a few of the tests that Dean Dougherty has already mentioned are missing. It is a technical society but it does embrace quite a few people who are truly professional by the standards Dean Dougherty has outlined.

In spite of the fact that the program indicates that I represent the Professional Status Committee of the Society, I am afraid that most of my remarks are going to reflect my personal views on things and not

necessarily those of the group that I am representing here.

I had planned to go into a few of the definitions, but I find now this is not necessary in view of Paul Robbins' remarks. Not only has he pretty well defined some of the things that we are going to be talking about, but I think that he has already established for me that there is this definite relationship between photogrammetry, surveying, and engineering. Most of my comments will be confined to four main points which I feel have not been really brought out in the open before and which, I think, might be worthy of bringing out here to help put the picture of photogrammetry into a little better perspective in relationship to surveying and to engineering.

The first of these arises as a result of my capacity in the Professional Status Committee in which I had an opportunity to go through some of the testimony that was given in the State of California before a legislative committee about a year ago. I found a statement within the testimony that tended to indicate, in fact almost flatly stated, that civil engineers were not involved in the early development of photogrammetry in connection with its application in the field of surveying and mapping.

I thought it might be well to state a few things to the contrary, since that same information might be propounded in other places. Citing my own past experience, I was appointed into the field of photogrammetry from a civil engineering register established by the United States Civil Service Commission. I went to work with a unit of the Corps of Engineers that was staffed and directed by civil engineers, and, I think, admittedly recognized by everybody as being engaged in some of the early development of photogrammetry in the field of surveying and mapping. I refer to the engineer detachment that was located at Wright Field, Dayton, Ohio. It was the antecedent of what we now know as the Engineer Research and Development Laboratories, at Fort Belvoir—particularly the topographic engineering department. That group is still staffed primarily with civil engineers and doing essentially the same work that it has been doing for the past twenty or thirty years. There are many other examples.

Think of the people in the Federal agencies who have predominantly civil engineering backgrounds and who had engaged in some of the early development work in photogrammetry. In fact, I believe the only outstanding example to the contrary that I am personnally aware of is Lee Eliel, also on our panel. As I understand it, Lee does not originate from a civil engineering background. Today, Lee is a member of the American Society of Civil Engineers, and for a number of years the firm that he represents has employed civil engineers in some of their key positions.

The second point that might be made concerns the nature of the private firms that we find engaged in photogrammetric mapping. I think that we will find that about all of the early entries into this field got started as a result of a background of aircraft operation or photography or both.

We all realize that both aircraft operation and photography had much to do with the development of the science in the field of surveying and mapping. Hence it was only natural that some of those firms that were early engaged in those fields got into aerial photography. From there it was a natural step into mosaics and related products, and a little later on they branched out into more specialized stereoscopic plotting equipment. In fact, I am personally aware of only two early exceptions: Brock and Weymouth and the Aerotopograph Corporation, both of which are now defunct. Even here I believe it is appropriate to note that, as these firms branched out into the more complicated applications of photogrammetry and surveying and mapping, they added civil engineers to their staffs for such work, or people with extensive backgrounds in surveying and mapping.

In contrast with this, we should recognize what has been happening in about the past ten years. During this period, we have seen a great increase in the number of firms getting into photogrammetric mapping, not from such a background. The great majority of those getting into photogrammetric mapping in the past ten years

have come from backgrounds of engineering.

Today, as a rough guess, I would say that probably about half of the private firms come from such a related background as aircraft operation or photography, whereas the other half come from an engineering background.

I think that a consideration of those facts might help in considering some of the problems that will probably be discussed here today. There is one other thing that I have not heard brought out as yet, and which it might be well to state, and that is in connection with the registration for professional engineers and land surveyors.

Paul can check me on this, but my guess is that registration laws in some States go back about fifty years. That is about the earliest. I think also, however, that the great majority of them have probably been enacted within the past twenty-five years. Does that check fairly close, Paul?

MR. ROBBINS: Yes.

MR. DICKERSON: We know that, about four years ago, the District of Columbia became the 49th "State" to enact such an act. So it has been in the past twenty- or twenty-five-year period that the great majority of States have enacted such legislation. If you will stop to think a moment, you will see that this period about coincides with the development of photogrammetry as applied to surveying and mapping in this country.

It was in about the period from 1920 to date that we saw this great development in the field of photogrammetry as applied to surveying and mapping. I believe, as a result thereof, many of these licensing laws may have been enacted in ignorance of what was going on in this field of surveying and mapping, and particularly in the specialty of photogrammetry as applied to it. This may have given rise to some of the conflicts that have come up in the past few years and of which there will probably be more discussed here today.

There is one other thing that might help put the matter in perspective—and that is the shortage in manpower. As we know, in the last fifteen years there has been a shortage in technically trained manpower in many, many fields. This has been true of surveying and mapping, and engineering and photogrammetry as well. The result of this has been that during this period everyone has been forced to get the job done as best he can, and as a result we have had to set our sights down from what has previously been considered as the basic requirements for entry into such work. In lieu of these, we have had to concentrate on on-the-job training to get the job done, and let me never be quoted as saying that the job has not been done. There has been much, much work done by this approach. The situation now is this: rather large numbers of people have come up through that source of training, and this has led some to raise doubts concerning the validity of some of the previous qualification requirements.

The main problem in my mind is that of convincing engineers and administrators that our field is a rather highly specialized one and that it should get the attention that such specialties deserve today. For example, it is common on many engineering staffs to find specialists set up to handle such specific subjects as structures, soil mechanics, hydrology, and so forth. However, you don't find it such a common occurrence to find that they have a specialist in surveying and mapping.

I think that, when the day comes that we can convince the engineers controlling such work that they do need the services of such specialists to handle their problems, we will find our position enhanced and we will also find that we will be able to be of more service in the overall engineering work which has been one of the tests Dean Dougherty has indicated is the measure of a profession.

LEON ELIEL DEFINES THE MASTER PROFESSIONAL

MR. ELIEL: You have heard from real experts on the subject of what constitutes a professional and what constitutes a profession. I am going to talk a good deal on that subject, not from the standpoint of an expert, but from the standpoint of how it looks to a layman. Before trying to define

the relationship between surveying and photogrammetry and engineering—in fact, leading up to it—I should like to clarify my own basic thinking on the matter. I think that the term "professional" is a very ambiguous one. It is used in a great many different connotations in a great many different ways. For instance, we talk about a professional baseball player. We talk about a professional prizefighter.

What do we mean when we talk about professional baseball players? First, we mean that he is no longer an amateur; that he is being paid for what he does. Secondly, we mean, of course, that that is the way he makes his living.

We also talk about professional writers and we talk about professional artists and we talk about professional engineers. So I am going to try to clarify a little further the particular narrow facet of the word "professional" that we are thinking about when we talk about a professional engineer or professional photogrammetrist.

So, to repeat a moment, what we mean by professional is, first, that the person is not an amateur, and, second, that he is making a living by practicing his profession. Third, and perhaps the most important of all, and the most difficult to define, we mean that he is performing a service combining a high order of learned skills made effective by superior intuition and judgment beyond mere knowledge. This last, I call the master professional.

Now the Dean and other people have said that better than I have said it. It is so difficult for me to grasp this complex subject that I think if we all fire definitions from different angles we may come a little nearer to a meeting of the minds of exactly what we are talking about when we say "professional."

I think it is that word, "intuition," which really seems to point up this term "master professional" that I have coined. Another kind of professional man, of course, is a doctor of medicine. What is a doctor of medicine and why is he a professional? He is a graduate of a college, he is not an amateur, and he is making his living practicing his profession. He possesses a very high order of learned skills; he is a professional doctor by reason of having passed his State Medical Examinations; and, as a result of having passed this, he is classified as a professional. But, actually, a doctor of medicine is a professional in the higher sense because the selective process of education to which he has subscribed and been exposed, and the examinations which he has passed, assure us that this man would have been dropped, would have failed to qualify, unless he possessed, and proved that he possessed, this certain superior talent that we might call, in his case, medical intuition—this characteristic that we might call, again, in his case, superior medical judgment.

Now we get down to the surveyor for a moment and we try to apply the same definitions. A surveyor is professional because he is not an amateur; he is a professional because he makes his living at surveying; he possesses a high order of learned skills. But here, I think, is one of the main distinctions: What he does and must do and the job he must produce can be clearly defined, phrased, and specified in words. Therefore, it is not necessary for a surveyor to possess this quality of superior intuition and superior judgment. He practices his skills as he has learned them. Certainly he is a very skillful practitioner. He knows all the shortcuts and all the best ways to do it, but he doesn't necessarily have to practice intuition. His patient doesn't die if he makes a mistake or exercises wrong judgment. So the surveyor is professional, but according to this term that I have invented, I wouldn't classify him as master professional, because his work is nearly always applying what he has been taught and doing what is specified.

The engineer, like the surveyor, is professional. He can apply a high order of learned skills. He may be capable of simply applying what he has learned in a routine way, or he may possess those other qualities of making his learned skills effective by superior intuition and judgment.

There is a certain measure of this quality of the master engineer. No degree is given for this quality. The most educated engineer, with many academic credits, may be

completely lacking in superior intuition and judgment. Thus, these qualities are the result of experience, of maturity, of receiving the confidence of the people he works with and is associated with. This implies still another quality in this particular type of master engineer. He must have an outgiving personality which causes people to recognize the qualities of intuition and judgment in him.

This is the master engineer, then, accredited by the faith of people in his entire character and personality. The master engineer may head a great construction company, for example. Even after a great dam is designed by a master engineer it generally takes master engineers with their intuition and judgment to build it because there are a lot of things that don't go exactly by the book. But though there may be master engineers heading the company, the work itself is contracting. It can be precisely specified in words. The results can be evaluated. They can be measured against the specifications. It is not the work of one master engineer, then; it is the work of him and his many employees, his entire organization.

This brings us down to photogrammetry. A big photogrammetric company may have master engineers in its upper echelons, but the job that has to be done can be precisely defined in words. At least it can very nearly be so specified. A photogrammetric company is a kind of a factory. It has a sort of production line. It may have artists like a lithographic plant has because of the fact that you have to get expression in contours and that sort of thing, but, nevertheless, it is in essence a manufacturing institution.

So the photogrammetric engineer is, like the surveyor, professional. Again going through these points repetitively: He is not an amateur, he makes a living at it, he possesses a high order of learned skills, he knows his business and his profession thoroughly from *A* to *izzard*. He is a professional. He knows photogrammetry, he knows aviation, he knows photography, he knows surveying, he knows cartography, he may know optics to a degree, he knows geodesy perhaps, and he knows many other things, but many of his employees and associates are not professional photogrammetrists. They are pilots, photographers, computers, surveyors, draftsmen, editors, stereooperators, exercising perhaps a high degree of learned knowledge in a very narrow field but perhaps not a broad enough field to entitle them to the classification of professional. Many of them are professional, but certainly not all of them.

None of these people, not even the photogrammetric engineer, need be a master professional, as he does not necessarily make his work effective by superior intuition and judgment. Maybe he has these qualities, but they are not essential as they are for a surgeon, for example. The cutting and the sewing are only parts of a great surgeon. His intuition and judgment are what make him great. The important reason to negotiate contracts—and that is one of the main subjects that this question of professionalism or nonprofessionalism in photogrammetry leads to—is not that photogrammetry is a profession; it is because unusual integrity is required of the photogrammetric engineer, and that is my main thesis.

Suppose you have a highway project that is going to cost perhaps $100,000,000, and it awaits the completion of a $50,000 photogrammetric map. Delay in starting the project is much more costly than the map itself because interest may be running on bonds, a great organization may be waiting for these maps in order to be able to move ahead with the project. Now when this map is finished there often isn't time to check the map and to require that a substandard map be made over again and brought up to standard. We are forced to make the best of a bad map quite often. Dollars make it necessary to accept it with a minimum of costly checking. A thorough check costs a big percentage of the total job.

The business circumstances of a map dictate that it should be negotiated with people of high integrity or that prequalification should weed out the unproven from big, important, costly projects. There is no substitute in photogrammetry for integrity. Integrity can only be selected and is implicit

to a quality of mind. It does not usually come with the cheapest price tag. That is why straight competitive bidding for photogrammetric services is bad. That is why some other means of procurement should be devised.

In summary, and going back to the title of our panel, I can say that only the licensed surveyor should make property surveys because they affect the wealth of the public and its convenience, and efficient operation. When the licensed engineer has a problem, he should decide whether he needs a surveyor or whether he needs a photogrammetrist, and he should usually employ a photogrammetrist by some kind of negotiation and seldom by straight competitive bidding. For, more than anything else, the buyer needs photogrammetric integrity.

MICHAEL BAKER CITES NEED FOR PROFESSIONAL INTEGRITY

MR. BAKER: I come to you today, not as a representative of the Pennsylvania State Registration Board, but as a registered professional engineer, as an individual, and with my own personal opinions, some of which I will express in a manner that I am sure will be professional in regard to your acceptance of them. I am most certainly sure that my good friend Paul Robbins, as Executive Director of the National Society of Professional Engineers, will disagree with me on some of my personal opinions.

The profession of engineering, in my opinion, is a great deal different from the profession of medicine and from the profession of law. I am sure you will agree on at least part of that. We do have somewhat the same professional relationship to the public, but we do not have the personal relationship that medicine and law hold to the individual client, except in certain cases.

Engineering today has become a big business, an enormous business, sometimes involving, in our relationship with a client, millions of dollars in fee under one contract. Much has been said and much has been written about the profession of engineering —about the codes of ethics in our profession, about integrity of the profession, and about the need for registration of the engineer in order to qualify him for the practice of engineering. Though it is most certainly necessary for me in my practice to be registered under the laws of the various States of the Nation, I believe that the registration of professional engineers either has been greatly overdone or needs some restudy on the part of the professional societies and the registration boards which have been enacted by law into the registration, or control of registration, of the professional engineers.

Since I have been privileged to become a member of Pennsylvania's Registration Board, I am learning a great deal more about the inside operations of the registration of professional engineers. I have been convinced since my membership on that Board that the registration of an engineer does not certainly qualify him to practice the profession of engineering. It certainly does not make him above and beyond reproach. I have learned of the many abuses of the registration laws, and there are many within the borders of our 48 States and our Territories. Abuses of the law, to create monopolies, have been mentioned in the papers —efforts to prohibit competition rather than to create and maintain a healthy competition within the profession; the failure on the part of some of the laws to permit the proper recognition by reciprocity or by recognition of one type or another of the professional practitioners in other States. Many of these things, I am sure, will be corrected over the years ahead by reason of the pressure from the societies upon the State legislatures to correct them.

The matter of integrity of the profession is being challenged, unfortunately, by a few who, though they recognize the necessity of registration, fail to recognize the necessity of maintaining their lives as members of our society above and beyond reproach, of maintaining integrity on behalf of the profession.

There exists today, within the professional societies, great abuse. Much talk is given about competition, about not bidding for engineering work. I am sure we are aware that bidding exists today within the profession for engineering assignments.

Some of it came to the front, not long ago, by action of the Executive Committee of the American Society of Civil Engineers. Much of it, however, has not come to the front. On occasions it comes to the point that reputable firms sometimes refuse to participate in such activities and other times go along with it because of the necessity of maintaining vast payrolls in this big business in which they are operating.

What goes with a big business, particularly in public works, and particularly where there is, by the code of ethics, not supposed to be competitive bidding for professional services? It provides and creates the most wonderful opportunity for the abuse of the integrity of man. It provides the means whereby corruption can arise, particularly where multi-millions of dollars of engineering fees are involved—the greatest temptation in the world—as a result of the growth of big business in the profession.

The profession is not above participation in such activities. I know, and I hope that Mr. Robbins will take comfort in the defense of the profession and say that such cases and such instances are most certainly a minority, and that there can be found parallels existing today in the professions of law and the professions of medicine where there are ambulance chasers and quacks. Truly that is so; but the difference is the fact that they are not dealing most of the time with public funds; and, secondly, they are dealing in paltry sums of money whereas the engineering profession is dealing in millions of dollars, sometimes, as I have said, even in one contract. So it is big business. Most certainly it is a profession.

Registration in itself does not necessarily qualify a man into this higher plane of professionalism as described by my eminent predecessor. Surveying most certainly is a profession itself. It is a branch of the science of engineering. A number of years ago I was privileged to speak before this same group and I gave a challenge as to the manner in which surveying is disregarded by government and by consulting engineers and practicing engineers, and relegated to an unimportant field in the performance of the overall development of public works or the utilization of our resources and manpower into things of service for people.

Much has been accomplished by this society, to its great credit, in bringing forth the importance of the activities of the surveyor, and more particularly the land surveyor. There is a difference, most certainly, between the surveyor and the land surveyor. And again, all too many people are qualified by registration to practice surveying who are most certainly not qualified by any means to practice the ultimate of surveying—land surveying.

In regard to land surveying, may I disagree with Mr. Eliel, who is an important member of the profession. Upon the land surveyor's intuition, upon his judgment, rest, sometimes, not only welfare and property values, but many other things that can cause great harm to the public if he has used poor judgment. Those things not only can cause immediate harm but can continue for generations beyond if the errors are not found and corrected.

Now, turning to the field of photogrammetry, it has been said that photogrammetry is a profession. I certainly agree on that as an engineer. In our practice we found that if we wanted to serve our clients properly we had to recognize this new science in engineering, and we have done so, as an important part of our engineering science and as a tool and aid to the proper and efficient and speedy development of our client's work.

Likewise, we who are privileged to sit on the Registration Boards for engineering and surveying find that there is a similar development taking place in other branches of engineering, some of which are not recognized by any board or by any law of registration existing in the States at the present time. For example, consider electronics or nuclear engineering. We in Pennsylvania have had at least a dozen applications for registration to practice professional engineering in the past six months from nuclear scientists. The Board throws up its hands and says, "If the man wants to be registered he must take the mechanical engineering, or the electrical engineering exams."

They refuse, and they are insulted because they are not recognized as engineers—and rightfully so. So there are other branches of the engineering science that have parallel problems with the photogrammetrists.

In California, the difficulty developed from the fact that there were those who were already registered to practice engineering and surveying who believed that photogrammetry, if it was to be practised in California, was a division of engineering. If they couldn't convince the State Registration Board and the officials of that State that it had to be under the engineering law, then it certainly was under the surveyors' division of the engineering law.

Work was given by the State of California to private practitioners in the engineering or photogrammetric field by competitive bids. I do not have the same objection to competitive bidding that others have expressed here, for I feel it is one of the surest ways of eliminating opportunities for abuse of the codes of ethics. But, in California, those who felt they had been hurt by the failure of the State to recognize engineering as being superimposed over photogrammetry, did succeed in creating considerable disturbance until the matter straightened out temporarily. How it will finally be resolved, I do not know; but there is an indication that they plan to resolve it by creating a license for photogrammetrists under the State Registration Board. That seems to be the trend that may possibly occur in other places.

It is my opinion that photogrammetry is just as much a profession in its own way as is surveying or any branch of engineering as registered by the State laws. I believe that there is considerable relationship between these fields, but not to the degree that surveyors, by means merely of having been registered, are qualified to practice photogrammetry, nor that photogrammetrists are and should be qualified and privileged to practice surveying, or engineering.

Photogrammetry has developed over the years through the efforts of various agencies of the United States Government, and through the fine work performed by a number of private companies who have been leaders in the field. It has had a healthy growth and it will have a continued healthy growth if the engineering professions do not become greedy in their attitude and try to haul it in under the State registration acts and then impose upon it many restrictions that will not permit it to have this continued healthy growth.

It is my opinion that the professional societies dealing with State engineers' boards should reappraise the registration acts and the manners in which some of them are enforced, with the idea of also reappraising their codes of ethics and determining ways and means of maintaining the integrity of the profession.

I believe, with respect to photogrammetry, that it does not need to be a science that requires registration as a prerequisite to practice, but if it is determined by the majority of those in the engineering profession and in the societies dealing with photogrammetry that it must be registered in some manner, then I would register it under the existing State laws as a division of engineering science, and I would create the required examinations and tests that fit exactly into photogrammetry instead of making the man take an examination in mechanical or electrical or civil engineering.

These are my personal thoughts and are given in the manner and in the strong terms that I have used to create a challenge, not to tear down the great work of the societies of the professions of engineering. If I can be helpful by such an attack and approach in bringing about a renaissance within the societies and the realization that maybe some of their codes and maybe some of their ideas aren't properly working to the interest of the societies as a whole, then I will be happy.

ROBERT LYDDAN DESCRIBES ASCE STUDY OF SURVEYING AND MAPPING

MR. LYDDAN: My comments will be divided into three parts: (1) what ASCE sees as a problem and what it is doing about it, (2) what the outcome of this ASCE effort might be, and (3) my personal opinion

as to what the important things are and what might be done regarding them.

As you know, the term "civil engineering" was originally conceived to cover all engineering work not of a military nature. The American Society of Civil Engineers was formed 103 years ago and is the oldest of the national engineering organizations. The others, covering mechanical, electrical, mining, and chemical engineering, came along later as those branches of engineering became independent entities.

ASCE has long considered the *ethics* of the practice of civil engineering a very serious matter. As many of you are aware, the matter of competitive bidding on a price basis has recently been, and is now, a very active question with ASCE. It is well known that ASCE holds that civil engineering is professional work, just as the American Bar Association holds that the work of a lawyer is professional work, and the American Medical Association holds that the work of a doctor is professional work. ASCE, in common with the Bar and Medical Associations, holds that it is not in the interest of the client or the public for professional services to be solicited by means of competitive bidding. The principal reason is that it is not considered possible to define the service that may be needed or specify just what judgment will have to be exercised.

The matter of competitive bidding in civil engineering is not new, but it does seem to have blossomed out into unusual proportions in the last year or two. The high point, I imagine, was the case involving bridge design work for the highway department of one of the States. After considerable study of that case, ASCE decided that certain members had definitely violated the Society's code of ethics, so about half a dozen members were suspended or expelled.

Also during the last year or two, there have been a few surveying and mapping projects in which contracts were awarded on a price competitive basis. Now, ASCE has not joined those who believe, or are drifting toward the belief, that surveying and mapping is not a branch of civil engineering. About three years ago, the Board of Direction declared it to be the Society's opinion that surveying and mapping is still a branch of civil engineering. With that recent reaffirmation of a long-held opinion, the Society clearly has grounds for concern when it believes that members engaged in surveying and mapping may be violating some of the Society's rules. It was in this setting, then, that the ASCE Board of Direction asked the Surveying and Mapping Division and the Committee on Professional Practice to look into the matter of competitive bidding on surveying and mapping work.

In considering how to tackle this problem, the Executive Committee of the Surveying and Mapping Division decided to set up a special committee having the assigned task of determining:

(1) Which phases of activity in surveying and mapping are professional and which are nonprofessional.

(2) Which duties and positions within each of these phases are on a professional level and which are on a nonprofessional or technician level.

(3) Which of the above activities or duties should be considered to be engineering work.

It is obvious that if, as a result of this study, clear and acceptable definitions can be established as to what part of surveying and mapping is engineering, and what part is professional, the problem before ASCE will be clearly defined—requiring compliance with all the Society's rules whenever any of its members are engaged in any surveying and mapping work that is held to be both professional and engineering work.

Now it might be said that ASCE already has held that surveying and mapping is engineering, so a shortcut to the end of one problem would be to supply definitions as to which phases are professional and which are nonprofessional. That would relieve the immediate problem, and we probably will approach it in that way in order to get something established soon. However, it is our opinion that, because there is now considerable belief that surveying and mapping should no longer be considered a part of civil engineering, that fundamental question should be explored as thoroughly as possible. If we can do a good job of decid-

ing that question one way or the other, I am sure a real service will have been rendered.

You will be interested in knowing who the members of our special committee are. The Chairman is Brother Austin Barry, and the other two are Al Quinn and George Whitmore. Al Quinn is Past-President of the American Society of Photogrammetry, and is now with the Aero Service Corporation. George Whitmore is a Past-President of both the American Society of Photogrammetry and the American Congress on Surveying and Mapping, and is now with the Geological Survey. Brother Barry is on the faculty of the School of Engineering at Manhattan College, and has been active in the affairs of the American Society for Engineering Education as well as an active member of the American Society of Photogrammetry and American Congress on Surveying and Mapping. All, of course, are active members of the American Society of Civil Engineers. You will note that the membership of this Committee represents the fields of education, private practice, and government service. It is, I am confident, a strong and well-balanced committee, and I am sure no group need fear that its point of view will not be considered by this committee.

The Committee is now developing a list of the various branches and sub-branches of surveying and mapping, and plans to tentatively classify each part as to whether it should be considered professional work, and whether it should be considered engineering. These tentative classifications are to be submitted to a rather large and representative group within surveying and mapping and engineering circles. All will be asked to express their opinions as to the soundness of the proposed classifications.

Now, as to where this matter might end up, I can only speculate at this time. Before doing that, I should point out that, in addition to being an old organization, ASCE is a large one—having about 37,000 members at the present time—and that the Surveying and Mapping Division is only one of thirteen technical divisions in the Society. Any important decision made by the Board of Direction will take into consideration the interest of the overall group the organization represents. Also, I believe such a decision will take into account the welfare of the consumer as well as the welfare of the producer of a service such as surveying and mapping. I think this is an important consideration, for what is good for those who use the results of our efforts will, in the long run, also be good for us. In view of the size of this organization and the breadth of the field, obviously I cannot presume to judge in advance just what the Society's final decision in this matter may be.

As for what might happen, it could be that ASCE will decide that no part of surveying and mapping should any longer be considered civil engineering. In that case, there would be no further problem so far as the Society is concerned. ASCE would no longer feel it had any responsibility for guiding or policing this activity. On the other hand, if ASCE decides that some parts of surveying and mapping do constitute professional engineering work, then I am sure the Society will expect any of its members engaged in such surveying and mapping work to comply with the Society's code of ethics, just as it expects any of its members engaged in sanitary or structural engineering to comply with the code.

Of course, all ASCE can do is expel a member who gets too far out of line. How serious that would be for anyone engaged in surveying or mapping will depend on the importance attached to such action by his fellow workers or by the clients he attempts to serve. If and when the State registration boards, the practitioners in surveying and mapping, and the national organization that represents the group all work together to make surveying and mapping truly professional work, then any disciplinary action by the national organization against any member will be very serious business for him.

Now, as to my personal thoughts on this matter, surveying and mapping usually involves the efforts of a team of workers rather than one individual, and I believe we have been too generous in letting any member of the team use the title of the

highest officer. We are too lax about letting the chainman, the instrumentman, or the party chief on a surveying party all use the title "surveyor." We need to define rather strictly those activities and responsibilities that require the degree of learning, judgment, and self-discipline necessary to make a truly professional job, and we need to set apart the supporting jobs that may involve high degrees of skill but nevertheless fall in the technician class.

In regard to the question of whether surveying and mapping should be divorced from engineering, I could be persuaded to agree that it may happen some day, and I can agree that maybe it should happen some day. As to when it should happen, I believe that, with educational facilities as abundant as they generally are in this country, if any group that calls its work professional does not have a fairly good educational machine for providing trained personnel, that group runs the risk of losing its claim to professional status, simply by definition. Until the surveying and mapping profession can point to some visible and productive educational facility it can claim as its own, my personal belief is that we should go slow in cutting ourselves loose from engineering.

CARROLL MERRIAM DISCUSSES PROFESSIONAL SERVICES

MR. MERRIAM: I may be criticized as not cognizant of the fact that man is still an animal competing in a world where the rule of the jungle is still prevalent, and where societies and associations such as ours of men with kindred interests should be militant in their fight to get for their members every advantage possible.

On the other hand, I regard highly that give and take for the good of mankind as a whole, without which we cannot hope to progress beyond the jungle. It is possible that for many years I have not had to fight for personal competition and vie with my fellow beings. It is also possible that I have been influenced by farsighted attitudes of certain men with whom I have been in contact, and you know them. These men have bent their efforts for the advancement of the profession through merit. From these contacts I have come to the general conclusion that, when looked at from a long-range point of view, many of our problems which seem in detail so complex gradually resolve themselves to relatively simple terms. It is principally when we try to draw conclusions in advance, with the thought of our self interest, that we become confounded.

About a year ago we were exercised over the effect of social security. Now I think the social security matter has taken care of itself and we can realize that how it is regarded from the point of view of the tax collector and social security benefits has nothing to do with how we are regarded in fact as professionals.

You have heard Dean Dougherty define the profession from the original standpoint, and it seems that we should logically advance along those lines. This is still another thought—that a professional could be considered as a man who professes to possess special knowledge or talent. Professing takes the form of making one's talents known to the public. If one were a merchant he could advertise, but professionals can't advertise. They must be content to profess.

The distinction between professing and advertising may seem very subtle, and, unfortunately, the former is inclined to break over the ethical bounds into the latter. The rules of the game are basically different. Advertising is governed by the principle of *caveat emptor*—let the buyer beware. The advertiser can say about anything that he wants, and actually go to telling lies about his product, provided that those lies are too absurd to be believed. That is perfectly all right in some cases, and that has actually been sustained at law.

Most articles sold by advertising, even if they should prove to be worthless, would not ordinarily ruin the purchaser. The purchaser at the same time may use the right of inspection and has redress in case the specifications are not met. He furthermore has the ability to know whether he is cheated or not. The man who professes, on the other hand, deals with a different brand

of product and under an entirely different basic principle as far as protection to the client is concerned. His product cannot be counted or weighed, as apples and eggs. The client has no means of testing or even intelligently judging the worth of what he has received.

Bills for professional services are not customarily itemized, and most of them are paid without question, simply on faith. The product is far from standard and, as soon as the professional contracts to do a certain piece of work at a set price, there is immediate risk that as the work opens up he will fail to be inclined to give his best in the interest of the client because that extra was not in the contract.

Like the physician who subscribes to his code to do all that he can in the interest of his patient, the engineer or surveyor cannot consider himself truly professional unless he will undertake similar obligation in the interest of his client.

In distinction to the principle of "let the buyer beware," the law takes a different attitude, an attitude which I fear is frequently misunderstood by engineers and surveyors. Briefly, I am afraid we are inclined to think of registration as licensing more in the sense of restriction of practice rather than of protection of the public.

A stumbling block in our thinking is the bound of distinction between the surveyor and the engineer. Much trouble arises because, as yet, we have not been able to make our situation clear even within the profession. In the minds of most engineers of my acquaintance, surveying is a kind of standardized procedure which many, but still too few, student engineers grudgingly learn as an exercise which, by its unpleasant nature, unworthy of an engineer, is supposed in some way to make the man a better engineer for having suffered.

In some schools it has become hardly more than an obsolete discipline about to be eliminated from the course. Consequently, if it has been regarded simply as a sort of probationary step, it is very natural for engineers who have become recognized engineers to say "Well, he didn't make the grade, and we can allow him to be known as a surveyor."

In the meantime, engineering has advanced toward the concrete and spectacular achievement while surveying still deals in the abstract and unseen; and yet it is an essential framework. Surveying has, in its unspectacular way, reached out and applied engineering principles for the service of man, and it possesses vast latent potentialities of extremely far-reaching import on human fortunes.

The bridge builder can say "See that bridge, how beautiful it is." It is hard for the bridge builder to appreciate the depth of control which permitted the parts of that bridge to fit together, and it is even harder for him to see the web which the land survey is weaving into our social well-being, hand in hand with the law. It may be hard to see, at present, how our peace of mind may be governed by how well the work of our survey is done today, rather than how cheaply the descriptions have been drawn up.

I feel it is unwise for half-processed engineers to proffer their services to the public and to be entrusted with purveying a product, the value of which the client has no idea. We know well that poor work is bound, in the end, to reflect to the discredit of the profession. Sometimes the surveyor is spoken of as half engineer and half lawyer. There is danger in this definition because the lawyer may say that half of this man is practising law without authority. We must therefore look for something more precisely describing the surveyor. My suggestion is that he be considered an engineer in the sense that he is applying the forces of nature to the service of man, but that he specializes in a technical aspect of the field where the lawyer alone would flounder without the engineer.

As such, the surveyor is essentially an engineer. I believe, at the same time, that it would be wise for boards of registration to make it clear that the candidate will be expected to give proof of competency, not only in the technical aspects of land measurement and what is popularly known as

land surveying, but also that he has sufficient familiarity with law and accepted custom in property matters to protect the interests of his clients to the extent that what they rely upon as evidence of title is technically correct and does not contain a license for a future lawsuit.

Throughout these remarks I have referred to "our profession." I am thinking of profession in the sense of professing the possession of special talents, and realization of the responsibility on our part thereby entailed. My answer to the question of the professional status of those who accept this responsibility is confidently: Yes, we are professionals.

MODERATOR DOUGHERTY: Thank you. We have had an excellent audience to listen to these six members of the panel. We are ready for questions, and answers from the panel. Before we do that I want to call on a person who has already been introduced to you as your Vice President: William C. Wattles.

WILLIAM WATTLES OUTLINES THE SITUATION IN CALIFORNIA

MR. WATTLES: It is impossible, even with the brilliant members of the panel, and in the time allowed, to cover the subject of reappraisal, especially in the three categories that have been named. It is also impossible for any two or a dozen or a hundred people, trained though they may be in ethics, in intuition, and in investigation into matters of definition, to arrive at a single conclusion. The world is too great and too complex for us to understand or to concentrate all of these ideas into one single thing. Could we do so, the world would not advance at all. We would become stagnant and crystallize.

It is the very fact of evolution, the very fact of growth, that produces this multiplicity and ideology. So possibly the discussion this afternoon might be considered merely a small dent in the whole matter of investigation into the scheme of things.

There is also the matter of definition. There have been a number of definitions given here, all good, but each having its own particular brilliance and its own particular facets. The whole diamond has not been uncovered.

About the only thing we can say is that any man, no matter what his vocation or his avocation, or his mere thinking, is a professional at some level. He professes, as Mr. Merriam has suggested. To get down to realization, however, in everyday life and business and association with people, we must draw in our horns and reduce our broad vision and our ideas in the clouds in order to obtain a rational view of what most people think. I have seen signs of "professional bootblacks" on the stands. Are they professionals? In their own minds, possibly so. But have they the intuition? The world at large bandies words about without their semantic consideration. And so we get many terminologies that are meaningless and that are warped and distorted from the true meaning of those words.

The matter of professionalism and registration is a great problem all over the United States. In California we have had similar difficulties. In some respects we have ironed them out fairly well. In other respects we have not. We are plagued—were plagued and still are in a way—by the necessary but unfortunate condition of the grandfather that Mr. Merriam spoke of in his paper on "Thoughts of a Grandfather." (Published in the Jan.–Mar. 1955 issue of SURVEYING AND MAPPING.—ED.)

Some of us who have been in business for many, many years became registered under the grandfather clause. Many of those who were so registered or licensed were not worthy. Many others were. There are many men today practicing in our vicinity in the West as subordinates, by reason of failure to be licensed or registered, who are actually more capable than their employers who are registered and licensed. However, those things eventually will be ironed out. You can't get away from these irregularities any more than you can get away from a certain percentage of crime in an honest civilization.

We feel that the registration laws, licensing laws, and boards that we have in California are among the best in the United States, in spite of the defects, which are

many. We have found in that registration —and I speak advisedly because I happen to be a member of a large committee of a surveying group which drew the original surveyors' license law in California, back in 1937—that there was too much overlap in the qualifications necessary for a license as a surveyor and registration as a civil engineer. That was prior to the time when registrations for mechanical and electrical and other engineers, so-called, and photogrammetrists, existed.

The California board and the Legislature based the specific distinction between civil engineers and land surveyors on one thing, primarily: the word "design." A civil engineer was a person who designed, for public health and safety and welfare, structures. In addition, the civil engineer was allowed to practice surveying without a license by virtue of his registration. He was allowed to perform any acts of measurement or determination of earth surface conditions, including geodesy, astronomy, and, although photogrammetry wasn't mentioned, it undoubtedly included that. The land surveyor, on the other hand, was limited to measurements on the land surface and above and below it. He was not allowed to design, in spite of the fact that previous laws with reference to the subdivision of land permitted him to design layouts and, in effect, to plan street positions, grades, and things of that sort. Today, subdivisions have to be developed by means of two engineering practices. The land surveyor may make all the surveys that he wishes; he may take all the grade profiles that he wishes; he may map anything that he wishes; but when it comes to laying the grade for the pipeline he must, under the city and the county regulation ordinances, have those plans for the grades signed by a registered engineer under the theory of design. It is awkward and it is unfortunate, but it has gone on so far.

The problem of photogrammetry that came up a year or so ago, as to whether a photogrammetrist was entitled to a license or whether only a civil engineer was allowed to do photogrammetric work, possibly is unfortunate in the same sense that a boil is unfortunate. When you have one you have to take care of it and get rid of it. There are a good many people in California who feel that photogrammetrists should be licensed and that their particular type of practice should be segregated from civil engineering.

Licensed surveying is a little bit different, and does not contemplate photogrammetry as such. There are, however, many, many others who feel that, although photogrammetrists may be and probably should be licensed to practice their art, that licensing should be restricted specifically to photogrammetric processes. But it should not encroach upon the practice of measurement and dimensioning on the ground as carried out by civil engineers and surveyors.

In other words, the feeling is that a photogrammetrist may operate his business in any way he sees fit from the air or from the ground with his pictures, his cameras, and what not, and do his developing and his analyses and those things, all right. But, in connection with the necessary ground control positions that are required for aerial topographic mapping, there must be employed a civil engineer or a surveyor because that is their province. There happen to be at the present time a couple of bills in the State legislature attempting or proposing to license photogrammetrists, and another bill, companion in a way, drawn for the purpose of eliminating the photogrammetric practice from civil engineering.

Speaking offhand—although the idea in the latter bill is good, the manner of its presentation, the language used, makes it very vicious in its ultimate result. There again it is a matter of semantics. It will mean that, although anyone who becomes licensed as a photogrammetrist can so practice, subject, of course, to the examinations and the application, it will, in effect, prohibit registered engineers from practicing photogrammetry in any respect whatsoever, including ground control. It will also prohibit licensed surveyors from developing ground control for photogrammetric purposes. The only bright spot in the bill is a clause which says that the photogrammetrist, as licensed, may take all ground control

measurements which do not have to do with the fixing of boundary surveys for land.

I will leave it to you gentlemen whether it is possible for any ground control position, obtained photogrammetrically or otherwise, to be established that will not or cannot be used, sooner or later, for subdivision boundaries, geodetic control which eventually affects land boundaries under the coordinate systems, or matters of that kind. It is an absurdity on its face. For that reason many of us who are members of ACSM, as well as many others, are fighting against this bill.

I have been asked to give you this resumé just to give you an idea of what troubles we have, as well as the troubles that you gentlemen have here and in other places in the United States. It is one of those problems that has to be approached cautiously and with a complete regard for the values of all parties, not any one particular group. We must maintain freedom from stifled competition. We must make registration something to be desired and to be worked for to attain the high status of a profession, not to stifle competition.

These various projects and professions that we are discussing today are overlapping in many respects. They have to be, in the basic parts; but in the specific parts they are separate and entire. A land surveyor is no more a civil engineer in the generally accepted sense of the term civil engineer, as a construction man, than darkness is like light. They merely have a common ground, a common basis.

There are three types of surveying: there is land surveying, there is surveying for construction purposes, and there is surveying for general purposes of all other sorts—geologic, forestry, timber cruising, road work of certain types, and things of that sort. These three branches are very distinct, although they overlap in some of their physical activities. But in the mental processes, in the intuitive and professional processes, they are entirely distinct.

A land surveyor, as has been said, must be an engineer in one sense, and he must be a lawyer in another sense. He must be, in addition, a title man. He must understand the relation between land and record, which is a permanent documentation of land conditions. He must understand that land shifts, that permanent record does not shift. He must understand just how far he can go in making the punishment fit the crime. He must know enough about the law to be able to advise his client to stay out of it, and also to be able to point upon the ground the positions which, in his judgment,—and there comes your intuition and your analysis—are the most favorable for the permanency of the record that the man has in the deed to his land. It is not a question of his possession. It is a question for the courts or some other means when a man fixes his fence two or three feet away over on his neighbor's land from his actual deeded portion of the land. The surveyor has no business trying to change that. The surveyor has no judicial authority, but he has a most excellent authority and ability to advise and consult with his client, and give him the best that he can of his services. That is professionalism and not in a crude sense. It is true professionalism.

I will tell you this: In my fifty years of experience in California with a thousand or five hundred surveyors and engineers I have yet to find a civil engineer, as such, who was not committed to the practice of surveying—as many of them are—who could go out and make a proper boundary land survey without trying many, many times. There have been more court suits, there have been more law cases, due to errors—not actually errors but deliberate misapplication of principles—by civil engineers who were not familiar with land surveying, when they went out and tried to locate somebody's boundaries.

The same thing, of course, applies to land surveyors who might inadvertently try to do some designing. Photogrammetry, being as young as it is, hasn't gotten into this picture yet on either side to any extent. I will say this, however: photogrammetry, as applied to analyses of ground conditions, aerial topography, and things of that kind, has been of tremendous help and is used in a wide area throughout the State of California. It has practically or very nearly

supplanted what we call the USGS topo sheets—the quadrangle sheets—because with it features can be almost pinpointed from a standpoint of search values for anyone who goes out to investigate property boundaries in the wide open spaces. Of course, it is a little different in the cities.

MODERATOR DOUGHERTY: I could not help but think, when Mr. Wattles was speaking, of that line in *Green Pastures*. Remember, the Lord sent Gabriel down to see how things were going on the earth. He came back and said: "Everything that has been nailed down has unloosed again." So it looks like in California they have kind of unloosed some things. Are there any questions that you would like to ask any members of the panel?

DISCUSSION

MR. WILLIAMS (Williams and Works, Michigan): I have a statement that I would like to make, rather than a question. We have been hearing the word "professional" bandied about here a good deal this afternoon. I wonder if the illustrious gentlemen of the panel and everyone else here realizes that the United States Supreme Court about four years ago, in the case of *The People* v. *American Medical Association*, determined that there were only two learned professions: law and theology. They probably would like to have kept it down to one, but they didn't care to leave their spiritual advisers out, so they took them in. No, what we must do is concentrate on the word "register." Our profession, if we can make it that, depends on the fact that we are registered in the particular line of work that we are doing.

MR. WOOLDRIDGE (Alameda County Surveyor's Office, Chairman of Northern California Section, ACSM): I would like to point out, in line with some of the thoughts here today, that the Northern California Section has started on a long-range program of bringing the various thoughts together. We have invited every interested society to form a joint committee to study this question of photogrammetrists and come up with a proposal for a session of the legislature two years from now which we hope can be the consolidated opinion of all organizations.

HAROLD WELLS ASKS FOR SOME ANSWERS

MR. WELLS (Private engineering and surveying practice, Denver, Colo.): We have had a little trouble in Colorado with our State registration. I have sent copies of a new proposed bill to Mr. Merriam a couple of times in the last year. This problem, I suppose, is not unique in the country. At the present time there is a bill on the floor for setting up a board of registration for land surveyors. It seems that every year, for about the last five years now, there has been a bill of one kind or another in Colorado proposed for either engineering or something else. Generally, one of these is passed and then about six months later some of the engineers take it to the Supreme Court of the State and have it knocked out.

I came here hoping that in the discussions I would be able to form an opinion to take back as to what could be done. It appears that all we do is to get more people together and more opinions. Of course, I have received some ideas here today, but I would like to be able, while I am here, to see if we can't take the time now to at least talk to some of the panel members personally and see if I can get some ideas as to what I can tell my legislators back home.

MODERATOR DOUGHERTY: Do you have a question to direct to the members of the panel now?

MR. WELLS: Yes. Mr. Merriam, I don't know whether you remember the bill which I sent you some time ago. The bill now before the State of Colorado is to set up a new board of registration for land surveyors. There is in existence now a board of registration for professional engineers. It was set up in such a way that it could not handle a registration of land surveyors. So we also have a board which was established by a law before this one and which is still in existence, although it contains the same registration, called the Board of Professional Engineers and Land Surveyors. I have two cards in my pocket for which I paid $5 each per year in order to rectify this error in the laws.

The question is, what stand can I take, representing the American Congress on Surveying and Mapping, in talking to my legislators about this proposed bill? As I understand it, one time in one of your letters you stated that you preferred that the land surveyors not be separated from professional engineers. Both opinions have been expressed here today.

Apparently the Supreme Court of Colorado has already taken the stand that surveying is not a branch of engineering. This is in conflict with ASCE. I need a little more help in forming an opinion, personally, that might be presented to them.

MODERATOR DOUGHERTY: Mr. Merriam, would you like to answer that questtion?

MR. MERRIAM: I can't say that I am in a good position to answer that question, but I feel that you are now in a good group of people while you are here at the Congress to get opinions which are more widespread than mine. It seems to me that the beginning point is the fact that your Supreme Court has definitely decided that you cannot group the two together. I believe it was declared unconstitutional on the ground of regulating two professions?

MR. WELLS: That is as I understand it.

MR. MERRIAM: It seems to me that, as far as Colorado is concerned, you have to go by the ruling of the Supreme Court. It seems to me it would be obligatory, then, to set up your own registration. You have sent me a copy of the law, and I think the comment that I made on that was on the list of subjects in which applicants were to be examined. There were no questions which indicated that knowledge of the law was required. Is that right?

MR. WELLS: Yes, sir.

MR. MERRIAM: Then I think you added some questions on that?

MR. WELLS: Yes, sir.

MR. MERRIAM: In the meantime I tried to get in touch with Mr. Golmer, who is the representative of the land surveyors on the Maryland board. I wasn't able to get hold of him. I feel he would be a person who would give you good advice from the point of view of being one surveyor member of a five-member board. I know what he has said. It is that the other members of the board are inclined to say, "This man didn't quite qualify as an engineer," therefore, as a sort of a consolation prize, they allow him to be registered as a land surveyor. I know that is Mr. Golmer's complaint. I believe that he will put you in touch with people in other States and give you much better advice than I can give personally.

MODERATOR DOUGHERTY: Mr. Robbins, have you had any experience to help answer this question?

MR. ROBBINS: As I sense the discussion, I believe there are possibly three questions being asked here. One is for assistance with respect to specific wording in a piece of legislation. I think there are several pieces of assistance which can be available to you. There are in existence, according to the count made some time ago, about 26 or 28 States in which land surveyors are registered. The specific laws involved, secured from any of the States, would, I am sure, be helpful as to the specific wording.

Another aspect is a summary of registration laws which has recently been published. It is available either through the National Society of Professional Engineers or from the publisher, A. L. McCauley, Jefferson City, Mo. This summary outlines the basic prerequisites of all the registration laws, both engineers and land surveyors.

Third is a composite of the various laws, which can be secured from the National Council of State Boards of Engineering Examiners, Post Office Drawer 1401, Columbia, S. C., at a cost of $5. Those, I am sure, will be helpful in giving you specific wordings.

Your second question, as I understand it, is that you are interested in the experience of some of the people at this Congress, and at various other places, as to how and what procedure has worked best. Actually, from the standpoint of land surveyors, two procedures are involved and are in practice, both of which have proponents. One is the joint board which registers both engineers and land surveyors; the other is separate boards.

The third phase of your question is what qualification should be established and what restrictions. There again you have to get that from the success or failure of certain existing laws. The New Jersey law, and I am not sure whether there is a joint board or separate board, has a very high standard and gets away from the idea of the "consolation prize." Unfortunately, there is that consolation prize aspect because usually the standards are somewhat lower for registered surveyors than for professional engineers.

Another question, which I gather you asked, and I am not at all qualified to state, is what should be the position of the American Congress on Surveying and Mapping? Somebody else will have to answer that one.

MODERATOR DOUGHERTY: Would anyone else on the panel like to add to that?

(No response.)

MODERATOR DOUGHERTY: Another question from the audience?

MR. BELL (Bell and Company, Kansas City): I would like to take issue with the panel on the implication that the surveyor is half an engineer, or that he is to be considered a half an engineer, or a half anything else.

Personally, I think the average surveyor would much rather be some sort of thoroughbred goat than an illegitimate sheep. I speak as an employer of surveyors and engineers. I would like to tell the members of the panel that I would no more put one of my registered engineers on a job of surveying than I would put one of my surveyors on the board designing a bridge. It is something to think about when you call him a half engineer. He has to know what he is doing.

ARTHUR McNAIR DEPLORES LACK OF SURVEYING EDUCATION

PROF. McNAIR (Cornell University): I would like to raise a question here. I believe Bob Lyddan raised this question earlier. This has to do with education. As a matter of historical event, surveying at one time was near the top of the heap in the civil engineering curriculum. In my own school, for instance, the summer survey camp was first given at the end of the senior year when a man was judged capable of conducting the type of surveys that needed to be made.

About 1898 this was lowered to the junior year. About 1920 it was reduced to the sophomore year. Now, though we have a five-year curriculum, surveying is still at the end of the sophomore year. This means, then, that the instruction in surveying, of necessity, has to be at a fairly low level.

The students get training primarily in construction surveys. There is a lot of engineering surveying which is far above this level. The mathematics involved, the training required, the judgment which a man must be able to exert, he does not have at the end of his sophomore year. The question I would like to propose is this: At the present time there is very little demand for training in any advanced surveying. There are probably not more than half a dozen schools in the country that are giving more than a token course which would include plane surveying and perhaps a little more. Why is this?

If there is a need for additional training in surveying, why doesn't it show up in the schools? I am sure that if there were a demand for this kind of work, if there were students who wanted to take these courses, the courses would be set up. The schools would accommodate the curriculum to them. This was brought out briefly on the panel: Until we do have some way of educating our surveyors we had better be rather careful about pulling surveying out of civil engineering, or out of some other discipline—geology or forestry, for instance—because we will find that we will be in a position where we have no means whatever of training the man to learn surveying.

I wonder if there is anyone on the panel who would like to comment further on this matter of the need for training for surveyors and what might be accomplished along this line.

MODERATOR DOUGHERTY: Does any member of the panel have an answer that would help solve this problem? Or at least bring it into the open?

MR. LYDDAN: That was my comment that I believe you were speaking of, Professor McNair. I don't have a quick answer to your question. If someone else would like to handle it I would be glad to be quiet. There is a problem, it seems to me, which stems from this fact: The demand for new men coming into surveying and mapping is limited. It is not infinitesimal, however, as witness the fact that the two organizations meeting here represent a few thousand people engaged in this kind of work. It would be interesting to see some figures on the new men taken each year into surveying and mapping work of some sort.

Obviously that number will be so small that a great number of our colleges could not afford to attempt handling just that subject. Only a few of them at most could. It occurs to me, at the moment here, that maybe those who hire these men, including the Federal Government possibly at the top of the list, haven't given the schools which were inclined toward providing this exceptional type of education the impetus or encouragement to grow by making a special effort to get students from those institutions on our payroll. The Civil Service Commission now requires a conglomeration of things which you can get from almost any technical school.

It might be that, if some encouragement were given to a few schools to develop as the provider of this talent that I speak of, those of us that hire that kind of talent should give them that encouragement and support by looking to them first when we want to hire a graduate.

MR. MERRIAM: I would like to consider another phase of that same problem. I am not so concerned about the training of men for land surveying because, at the present time, it seems to me that all you can do is start from the training given in the school and then develop the land surveyor through apprenticeship in offices already established that are doing land surveying business.

On the other hand, the thing that I am concerned about is the loss to engineering if sur-

veying is divorced from it. I feel that the surveying discipline is very definitely a part of what an engineer needs in order to make him a better engineer, and that we should approach things from the philosophical, the imaginative, point of view, and make more out of the instruction in surveying which would be valuable to the engineer.

I know that one university let surveying slip entirely away on the grounds, "Well, we will teach it if there is any demand for it." In other words, they are depending for their policy on the judgment of men 19 years old as to whether it is something that is needed by the engineer.

I believe that the instruction in surveying could be made to bring out engineering imagination and it would become a much greater and more important part of the training for the engineer. I hate to see the loss from that point of view.

MODERATOR DOUGHERTY: I would say this: There are about 4,000 members of these two societies—counting duplications, maybe 5,000—but a half million engineers in the United States. You can see the reason why colleges begin to weigh one against the other—one percent against the other 99 percent.

PROF. McNAIR: Could I amplify just one point there that Mr. Merriam made? I wasn't intending that at the schools they would necessarily teach land surveying, but rather that some engineering surveying should be taught, so that men will know something about physics, about electronics, about some of the earth sciences which are necessary for advanced surveying. That is being done, as we learned in the discussions this morning. Some of these men would be capable and able to go ahead into the profession as it will be 10 or 20 years from now.

I would also like to propose one other thing in line with what Bob Lyddan said, and that is that this is the American Congress on Surveying and Mapping. The American Congress on Surveying and Mapping has no award at present. I don't know whether this is a fixed policy of ACSM or not. But I can't help but admire the few men in surveying who are trying, by their own intestinal fortitude, to improve their position in graduate work so that they can do a better job in teaching surveying when they go back to their own schools. This graduate study, by and large, is subsidized from their own pockets or by research projects through government agencies.

It seems to me that ACSM might very well consider establishing a fund which could be used, even if it were only on a loan basis, but perhaps better on a scholarship basis, to enable some graduate student to pursue graduate work so that he could improve his status and do a better job, both professionally, as we have heard that bandied about today, and educationally, to help the engineers of the future.

MR. WATTLES: May I say for the benefit of the professors of the Education Division that it might be well even to take the simpler so-called trade-school method of extra education of surveyors. In the University of California, particularly in the University of California at Los Angeles, there have been and are still operating extension courses for the benefit, principally, of adults, of people out of college, who want so-called refreshers in their line of endeavor.

Those extension courses cover all branches, not only surveying, mathematics, and engineering, but all sorts of work. For the past two years we have had in the University at Los Angeles extension courses in engineering and surveying practice specifically pointed toward land surveys. It is a twelve-week course, once a week, two and a half hours, in which the average attendance has been twenty-four, almost entirely made up of men in the surveying game —land surveyors or draftsmen in oil companies or others who want to familiarize themselves and train themselves in the land surveying angle of that profession.

They are very avid for information. They get all the books they can get and they get all of the instruction they can get through those courses. That may not be, shall we say, higher education, higher institutional education, but attached to a college it has a prestige and it has a tremendous value and benefit to men already out of school, some of whom have never attended college but who want to improve their abilities.

That might be something for the colleges to think about—to establish a series of extension courses for refresher purposes for people who cannot continue graduate work or who cannot get all that they want in the regular college course, or who need extra refreshers.

As an example, in one of the junior colleges in Los Angeles, the Harbor College, near the oil wells, courses have been established in such things as chemistry and oil engineering, and petroleum work, and that sort of thing. Every year a large group of men working in the petroleum industry, in the refineries which happen to be close by, come over to the school to take additional courses because they have to

keep up with modern practice and developments in the chemistry of petroleum engineering. That same thing can apply in other things.

MODERATOR DOUGHERTY: I think you will find that very generally over the United States they are giving these extension courses.

PROF. McFARLAND: (University of Michigan): I would like to add a little bit to the picture that Prof. McNair gave you. I would like to do it right now because I think it should be the responsibility of this organization to do something—I don't know what—about the situation.

Briefly, I graduated from the University of Michigan in 1917. I had to have 17 semester hours of preparation in surveying, including a required course in astronomy. Today the University of Michigan civil engineering graduate has to have 11 hours of preparation in surveying.

Prof. Brinker, by questionnaire, investigated the situation thoroughout the country and found that the average is about 11.4. That average varies from, I believe, a low of 3 semester hours in one of the eastern schools—to an estimated 26 hours in one of the middle western colleges. I say estimated because it is a little difficult to make exact evaluation of these term school credits.

If there is so wide a disparity in judgment as to what is desirable for civil engineering to have in the way of surveying training, there must be some very loose thinking floating around some place. It seems to me that this organization should set itself at the task of trying to discover what the matter is, and, secondly, of trying to remedy it in the best way that it can.

MODERATOR DOUGHERTY: I find that our time has run out. I want to thank the panel for their excellent work. The meeting is adjourned.

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The Adjustments of the Jig Transit

By PHILIP KISSAM

PROFESSOR OF CIVIL ENGINEERING, PRINCETON UNIVERSITY

THE NEWEST BRANCH of surveying, optical tooling, has introduced a number of problems for the surveyor that, while they have always existed, are of negligible importance in outdoor work. The tolerances allowed in optical tooling are frequently on the order of plus or minus one second of arc, or one part in 200,000, while the distances involved usually fall between 3 and 100 feet. To illustrate, at a distance of 83 feet only 0.005 inch error is allowed. It is evident that, if such accuracies are to be obtained, possible errors as small as 0.001 inch must be sought out and eliminated if possible.

When errors of such small magnitude are taken into consideration in the adjustment of a jig transit, an entirely new geometric theory emerges that affects all of the adjustments that have to do with the line of sight.

Presented at the Fifteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 9–11, 1955.

GEOMETRIC REQUIREMENTS

Figure 1 shows the fundamental geometric requirements of these adjustments. In addition to the usual requirements, *the line of sight must pass through the azimuth axis.* For outdoor surveying, the usual manufacturing processes will bring this

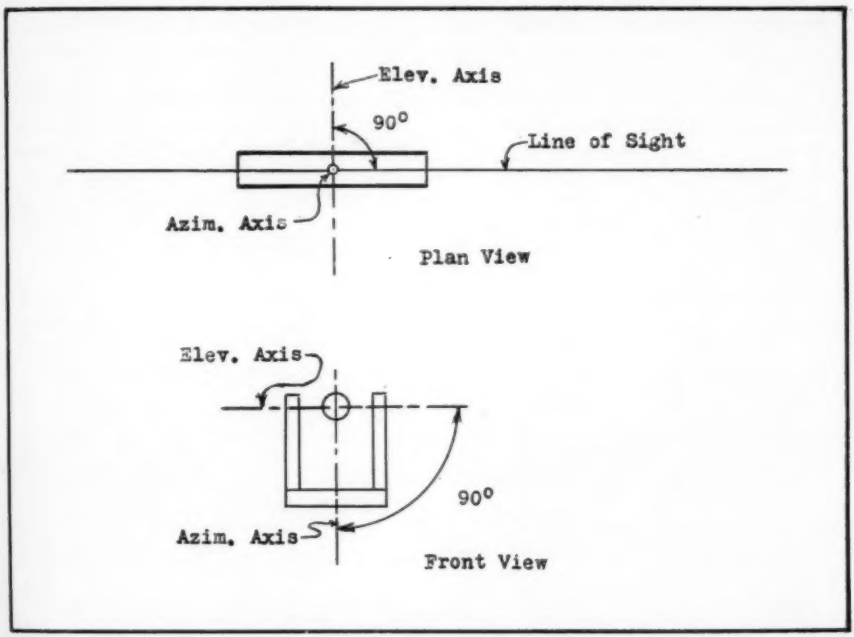

FIGURE 1.—The line of sight must be perpendicular to the elevation axis and must pass through the prolongation of the azimuth axis. The elevation axis must be perpendicular to the azimuth axis.

about closely enough for all practical requirements. For optical tooling, the transit must be designed so this condition can be precisely attained by adjustment.

The usual procedure for testing for this requirement is often called the long-and-short adjustment. The instrument is aimed at a distant point (or a collimator) and, without changing the direction of pointing, a nearby horizontal scale is read. The instrument is adjusted until the scale reading is the same with the telescope both direct and reversed. The other adjustments are usually based on the well-known tests that have been used for years. But, strangely enough, it has been found that, when the adjustments are made in the usual way for the basic geometric requirements, the instrument does not yield its maximum accuracy.

A moment's consideration will explain this difficulty. Except when the axicon lens is used, every telescopic sight must have a movable optical part for focusing. Since nothing made by man can be perfect, the movable part can never be made to follow the optical axis exactly. Even with the greatest care in manufacture, there must, of course, be some residual error. It is evident that, as the optical part is moved in focusing, such an error will change the direction of the line of sight. Accordingly, points on the line of sight at different distances from the transit will not be quite on line with each other. In fact they will lie on a curve. The curvature will not be great. With good manufacture, the departure from a straight line can be kept to one or two thousandths of an inch. But the problem is presented: what is the best way to adjust a transit so that the effect of the curvature of the line of sight is minimized?

Even though the axicon lens requires no moving parts, it is not free from the difficulty described. Assuming for a moment that a perfect lens can be manufactured, unless the light source is exactly in line with the optical axis, curvature will result. Again, since nothing is perfect, curvature cannot be eliminated.

MINIMIZING THE EFFECT OF SIGHT-LINE CURVATURE

Figure 2 illustrates the type of curvature that occurs with any telescopic sight. Since the greatest movement of the optical part (or with the axicon, the greatest change of angle) occurs when the sight is short, the sharpest curvature occurs near the instrument. It seems evident that it is not the line of sight that should fulfill the requirements usually assigned to it; rather, a *straight line chosen so that the departure of the line of sight from it is minimum* should be made to fulfill the requirements.

In figure 2 it is assumed that the longest sight that normally will be used is 100 feet from the point of minimum focus and the shortest sight is 0 feet from the same point. The line is chosen so that the departures of the line of sight at 0 and 100 feet are equal and have the same value as the departure in the opposite direction near the center. Such a line in this case cuts the

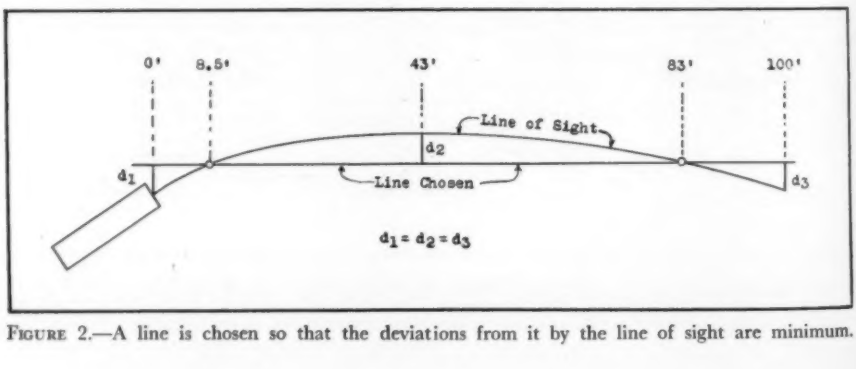

FIGURE 2.—A line is chosen so that the deviations from it by the line of sight are minimum.

line of sight at 8.5 feet and 83 feet. The instrument must be adjusted so that the line is perpendicular to the elevation axis and passes through the vertical axis. To determine how this can be accomplished, it is first necessary to analyze what actually happens when the transit adjustments are made in the usual way.

The upper drawing in figure 3 shows the geometric results after the usual long-and-long adjustment is complete. This adjustment is assumed to make the line of sight perpendicular to the elevation axis. What has been accomplished is merely to adjust the instrument so that it will transit direct and reversed between two points such that a line connecting them intersects the azimuth axis.

In the figure, the error of the intersection of the line of sight with the vertical axis has been greatly exaggerated. Note that the part of the figure *AC* is symmetrical with one position of the elevation axis, the part *AD* with the other, and the two parts, *AC* and *AD*, are equivalent.

The lower drawing in figure 3 shows the result of the same adjustment when the foresight and backsight are equidistant. In this case the line joining them intersects the azimuth axis and is also perpendicular to the elevation axis, by symmetry.

What happens when the long-and-short adjustment is applied? This adjustment is assumed to make the line of sight pass through the azimuth axis. The upper part of figure 4 shows the result. The instrument has been adjusted so that the line of sight, both direct and reversed, will pass through two points that determine a line that passes through the azimuth axis.

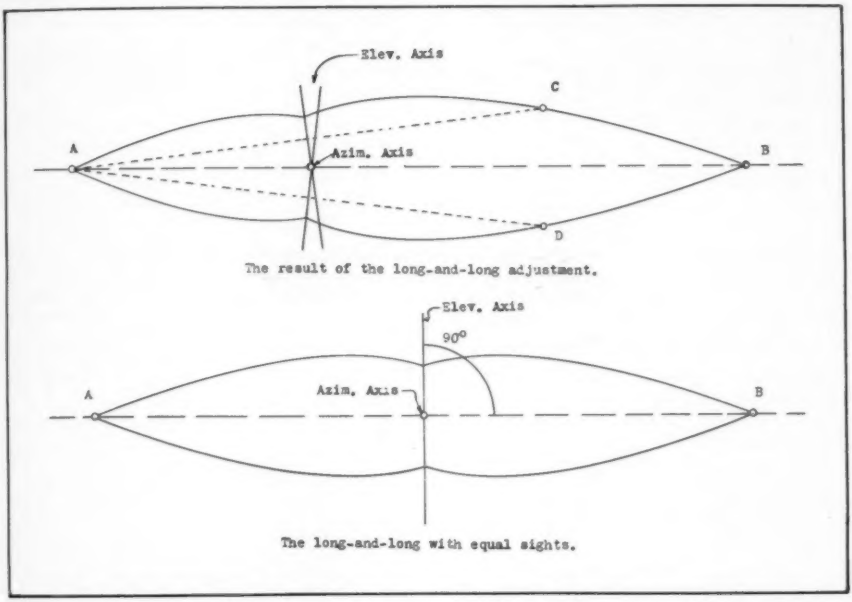

FIGURE 3.—The usual (long-and-long) adjustment of the reticule merely establishes two points, *A* and *B*, such that a line joining them passes through the azimuth axis. If *A* and *B* are equidistant from the instrument, the line *AB* is perpendicular to the azimuth axis as well.

THE KEY TO THE SOLUTION

These analyses of the long-and-long and the long-and-short adjustments give the key to the solution. If, as shown in the lower part of figure 4, the transit can be adjusted

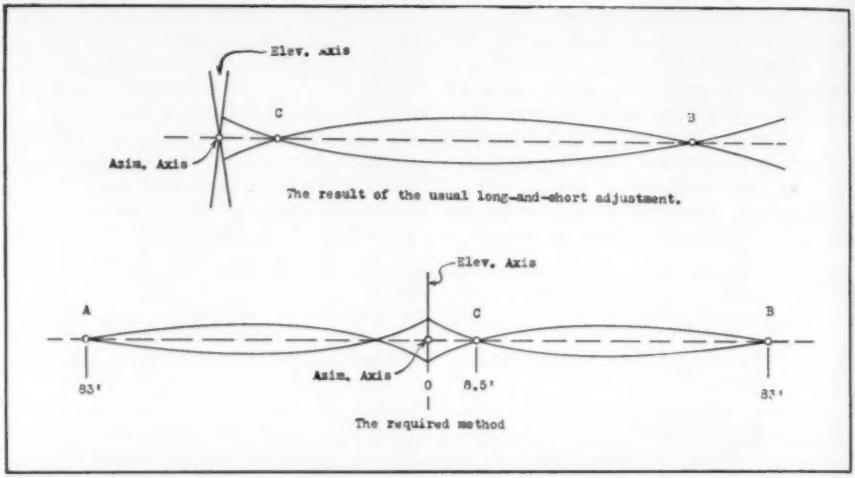

FIGURE 4.—The usual adjustment for the intersection of the line of sight with the azimuth axis (the long-and-short) merely establishes two points on a line which passes through the azimuth axis. The long-and-long must be combined with the long-and-short and the sights used must be of specified lengths to attain the desired results.

so that the line of sight, both direct and reversed, will pass through three points properly placed, the line desired will be perpendicular to the elevation axis and pass through the azimuth axis.

Going back to the example chosen, if the two points for the long-and-long adjustment are placed at 83 feet from the point of minimum focus, and the scale for the long-and-short is placed at 8.5 feet from that point, the desired line will pass through the azimuth axis and be perpendicular to the elevation axis.

Unfortunately, the two adjustments conflict with each other. It is probably best to start with the long-and-long adjustment and then to make the long-and-short adjustment. They must then be repeated until both tests are satisfied. The lateral shift required for the long-and-short will only affect the long-and-long slightly, and vice versa. As the two become perfected, each affects the other less.

ADJUSTMENT OF THE ELEVATION AXIS

It is still necessary to consider how to adjust the instrument so that the elevation axis is perpendicular to the azimuth axis. This adjustment can be made entirely independently of the other two.

No matter how curved the line of sight may be nor where it is placed with respect to the elevation axis, any particular point on the line of sight will generate a circle when the telescope is rotated about the elevation axis. The plane of this circle will always be perpendicular to the elevation axis. If this plane can be made parallel to (or to include) the azimuth axis, the elevation axis will be perpendicular to the azimuth axis.

When the elevation axis is out of adjustment, the azimuth axis (extended) intersects this plane at some point (since it is not parallel to it). The angle between the plane and the azimuth axis must remain constant when the instrument is turned about the azimuth axis.

Assume, then, that a target is observed with the telescope direct. Consider the plane of a circle generated (when the telescope is rotated on the elevation axis) by that point along the line of sight that is in contact with the target observed. Call this

plane *A*. Consider a similar plane created by an observation with the telescope reversed. Call this plane *B*. Both *A* and *B* will be perpendicular to the elevation axis and (if the elevation axis is out of adjustment) they will intersect at the same point on the azimuth axis (extended). The line of intersection of the two planes *A* and *B* will be the line joining their intersection on the azimuth axis (extended) and the target.

To adjust the elevation axis, it is necessary to make this intersection line parallel to the azimuth axis, because, when it is parallel, the planes *A* and *B* will be parallel to the azimuth axis, which is the required condition.

Accordingly, to adjust the elevation axis, it is necessary that the high target and the low target (fig. 5) shall be on a line parallel to the azimuth axis. To attain this condition, they should be placed so that, when measured at the instrument, the angle of elevation of the high target equals the angle of depression of the low target and the slope distances from each of the targets are the same. Since these two distances can be of any magnitude as long as they are equal, collimators can be used.

It is convenient to have a scale on the reticule of one of the collimators. Under these conditions, the elevation axis is adjusted until the line of sight strikes the crosshairs of one collimator and some certain point on the scale of the other, when observed both direct and reversed.

Since on good jig transits it is seldom that the curvature of the line of sight exceeds a few thousandths of an inch, the refinements outlined may seem unnecessary. However, since such extreme accuracies are required and since the changes in the adjustment procedures are so minor, it is the belief of the writer that they should be adopted as a regular procedure for the adjustments of all jig transits.

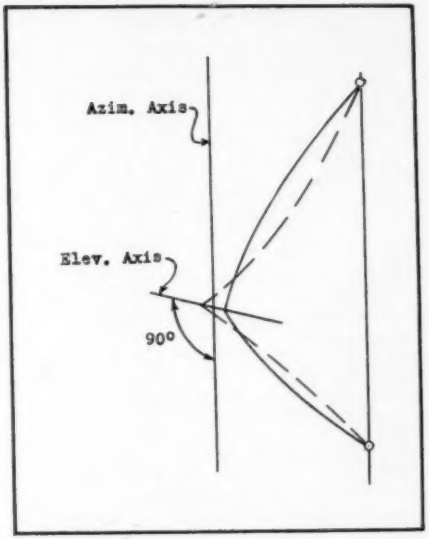

FIGURE 5.—The adjustment of the elevation axis must be made with equal length sights and with nearly equal vertical angles.

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Geological Survey Status Maps for 1955

THREE STATUS MAPS for the United States are published annually by the Geological Survey. New 1955 editions now available are Status of Topographic Mapping, fifth edition; Status of Aerial Photography, seventh edition; and Status of Aerial Mosaics, fourth edition.

Topographic Mapping.—This status map shows topographic and planimetric quadrangle maps, produced by the Geological Survey and other Federal agencies, and published at various scales ranging from 1:24,000 to 1:250,000. These quadrangle maps have been appraised and classified in accordance with Geological Survey standards as indicated by a map appraisal key. The classification shown indicates the best available quadrangle map. The names of published maps are shown on sales indexes issued for each State.

Aerial Photography.—This status map shows all areas known to have been photographed by or for Federal, State, and commercial agencies. Where areas have been photographed more than once for special purposes, the coverage considered most suitable for average needs is shown by color pattern as primary photography. Secondary photography is shown by solid color. For detailed explanation, a text is given on the back of this map.

Aerial Mosaics.—This status map shows all areas for which aerial mosaics or photo-maps are known to have been compiled by or for Federal, State, and commercial agencies. The numerators of the designating fractions indicate the dates of compilation of all areas except those controlled by the United States Air Force and the Army Map Service, in which cases the date applies to the year of photography. The denominators of the fractions indicate the scales of the mosaics. For detailed explanation, a text is given on the back of this map.

Copies of State sales indexes, the status maps, and further information concerning current projects, availability of maps and advance map materials, geodetic control data, aerial photographs, and mosaics may be obtained from the Map Information Office, U. S. Geological Survey, Washington 25, D. C.

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Map Use in City Planning

By LEO J. ZUBER

PRESIDENT, GEORGIA SECTION, AMERICAN INSTITUTE OF PLANNERS

CURRENTLY and historically the city represents man's most intensive use of any part of the earth's surface. In no other work or occupation does man concentrate so much of his activity, his energy, his wealth, as he does when he builds and maintains a city. The future will not likely witness any essential deviation from this. Now, as in the past and as expected for the future, the value of the physical plant represented in the tangible substance of the urban structure almost defies estimation; but, particularly in the case of larger cities, anyone would readily admit its astronomical proportion.

Today our cities tend to extend themselves horizontally; when a corporate limit is reached, the urban character of development frequently continues unabated. The urban fringe consumes land; the most impressive observable characteristic continues to be the intensity with which man utilizes the land with his many works, with steel and stone, clay and concrete, brick and glass.

But cities do more than grow horizontally. They also grow old and tired within; this part, then that part, wears out. But, unlike an old shoe, weary with miles, it cannot be cast off. So we call those parts slums; we drive through them looking the other way, if there is another way, and brush the matter off with some observation on the "kind of people that live in those places."

City planning generally and city planners specifically have a hard time keeping up with, let alone ahead of, urban growth. Like any other professional worker, a planner has his problems. Not the least of these is the lack of maps adequate and suitable for his work. No one need tell an ACSM group about the character and condition of the available mapping in sections of our country today. In city planning, there is no adequate substitute for a good map, an accurate map, a reliable map, and, above all, an available map; yet many planners still have to resort to every device known to man in supplying their needs for maps.

Urban growth today ignores city, county, even State lines. City and county maps, at scales useful for planning purposes, have an uncanny way of stopping at their respective corporate boundaries; the apparent "city" doesn't stop there, just the maps. This is only the beginning of the first problem; others will soon join it. Soon the planners' anthem begins with the old, familiar refrain, "What we need is a good map of this area."

That is always the objective—a good map of the area. In planning terminology, that means more than a single map. It means several maps, planimetric and topographic, at various scales, as nearly current as possible, and always with reasonably reliable, accurate information.

If that is the objective, how do we achieve it? The solution to the problem is no different today than it was yesterday, and no different than it will be tomorrow. Public apathy is scarcely to be blamed; professional apathy is my initial concern. Every locality, large or small, has a variety of map users. Most have grown old and evidently fairly proficient in using some old document that they will swear by, while others attempting to use it would do so with other sentiments. Map users in every locality should be *the first* to recognize and *the loudest* to announce the need for good maps. Vigilance and perseverance, persistence and a united front, are the price of maps.

Our cities are going to continue to grow horizontally. With that growth, and even preceding it, goes the extension of utilities, expressways, and major highways, as well as local streets; school sites must be located; subdivisions and shopping centers must be designed and developed. Planning-wise, every one of these activities should be done over and over again on accurate map bases

so that the best technical solution which it is possible to reach at a given time actually has a chance of being attained.

In the older urban cores, blight and slum sooner or later will be cut out and the physical plant in that part of the city will be renewed. In renewal, those areas will likely have a tax productivity in excess of anything they have ever before experienced.

Urban expansion, urban renewal, and urban development generally are the planner's fields of operation. For him the map is a basic, fundamental tool. The cost of developing a map may loom large in the minds of some; but professional map users know, and they therefore should make known, the real cost of not having adequate map bases for a community.

Vigilance and perseverance, persistence and a united front, are the price of maps. Recurring budget provisions at local and State levels for map development and maintenance should be the rule, not the exception. Similarly, recognition at local and State levels of an effective map agency should be the rule; one department or office charged with this responsibility and endowed with some principal, as well as with some interest and some enthusiasm, could cover itself with glory by keeping a locality's maps current. By working quietly and consistently, the service need not be any great thorn in the side of the taxpayer.

Every aspect of urban planning involves maps. There is no escaping their need. Providing and maintaining them need not be a mountain range athwart the path of urban progress.

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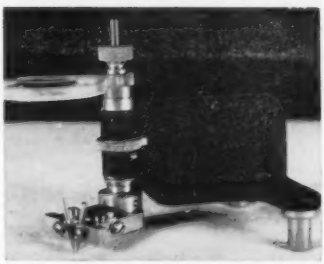

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Shortcomings of Contour Lines

By LLOYD E. MARSDEN
U. S. GEOLOGICAL SURVEY

MANY MEANS have been devised for showing the shapes of ground surfaces on topographic maps, but contour lines are by far the most versatile and are now the most widely used. The approximate elevation of any point and the slope of the ground can be determined from contour lines; at the same time, contour lines provide a map picture of the landscape. And yet it is generally recognized that the pictorial effect is seldom entirely satisfactory because contour lines have serious deficiencies as a pictorial medium when they are the only means used to show relief features. The extent to which they are successful in portraying a picture of the landscape depends on the fidelity with which they are drawn and even more on the contour interval that is used—the smaller the contour interval, the better the picture. On the other hand, the contour interval is definitely related to the horizontal scale of the map; if the contour interval is too small in relation to the map scale, the map becomes crowded with contour lines and confusing—even illegible—to the map reader. Moreover, it is costly to compile maps with small contour intervals.

This discussion is concerned primarily with general-purpose maps—maps that are made to serve a wide variety of uses and that should show the most information at the least cost.

American mapmakers have realized for a long time that contour lines, when used alone to portray relief, have many shortcomings. At the same time, they have been

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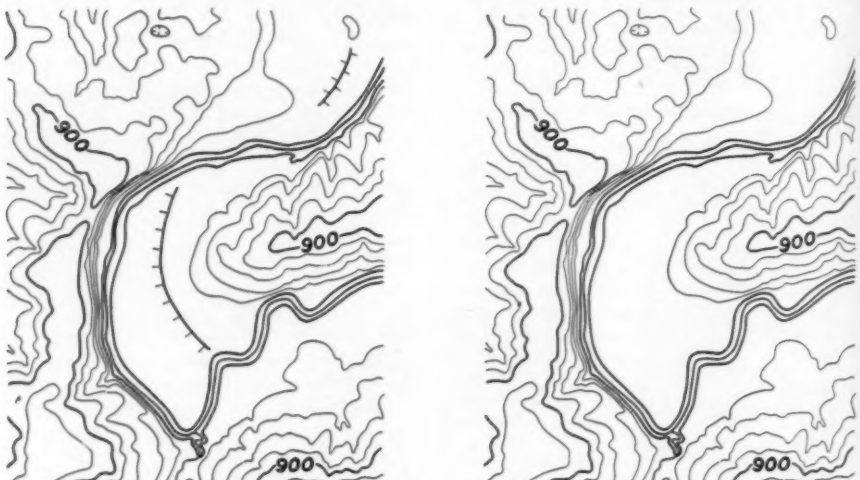


FIGURE 1.—At right, a section of a 1: 24,000 scale map of Kentucky. At left, the same area with symbols added to show a terrace and a low ridge that are missed by contour lines.

FIGURE 2.—At right, section of a 1: 24,000 scale map, contour interval 20 feet. At left, symbols have been added to indicate tops and saddles.

slow in adopting new means to overcome these deficiencies.

In this paper a few of the shortcomings will be pointed out and some possible remedies will be suggested. No doubt others will occur to the reader.

SMALL FEATURES NOT REPRESENTED

In the first place, contours frequently do not show small but significant features of the topography. When the selected contour interval is large enough to portray the general shape of the land satisfactorily without over-crowding the map, many small but prominent features cannot be shown because they intersect only one contour. For these reasons, low banks, terraces, small tops, and many other features cannot be shown on contour maps. This shortcoming can be remedied by adopting some simple types of symbols.

TERRACES SHOWN BY HACHURE LINES

Figure 1 is a section of a 1:24,000 scale map of a flat river valley in the Kentucky hill country. The contour interval is 10 feet. On the right side of the figure the open valley of the river bend is represented as featureless and flat, but actually there is in this area a steep, curving terrace that was formerly the river bank. It is very important on the ground but too low to be shown by the 10-foot contours. On the left side of figure 1 the same area is shown with the terrace indicated by a hachured line with the hachures pointing toward the low side. At the upper right of the left half of figure 1 is a low ridge shown by a variation of the same symbol; that is, the hachures are pointing in both directions. The presence of these features is obviously important to anyone interested in this area, yet the contour interval that is appropriate for the map as a whole fails to show them. The features are easily seen on aerial photographs, and the cost of compiling them would be negligible.

TOPS AND SADDLES SHOWN BY SYMBOLS

Figure 2 is a section of another 1:24,000 scale map; the contour interval is 20 feet. As can be seen on the right, the 20-foot contour interval does not show any of the numerous small tops and saddles in this

area. A person wanting an exact position for locating himself or making a more detailed survey of the area would be disappointed or downright irritated. On the left side of figure 2 the exact locations of the low part of the saddles and the high part of the tops have been shown by elementary symbols. (These symbols have been intentionally exaggerated in the illustration. On a map they should appear inconspicuously.) The additional cost of compiling these tops and saddles would be negligible as they are readily apparent on aerial photographs. The added positions would not only be highly useful to a map user but would also aid the engineer during the field-completion phase of producing the map.

CONTOURS NOT SATISFACTORY FOR PORTRAYING CLIFFS

From a pictorial standpoint contour lines do not portray cliffs satisfactorily. A cliff is shown by several contours coming together into a single carrying contour to indicate the vertical slope. While this treatment is satisfactory for indicating differences in elevation, the location of cliffs on the map is not quickly apparent—a close examination is needed to pick them out. Figure 3 shows an area in eastern Kentucky where there are several conspicuous limestone cliffs. On the right, the cliffs are shown in the conventional manner—by carrying contours. On the left the cliffs are represented by heavy black lines. In this black-and-white illustration the difference in treatment is not as apparent as when the black lines are superimposed on brown contour lines. True enough, the use of black might present a register problem in reproduction, but apparently other mapmakers have been able to overcome this difficulty.

The French have gone even further in using black symbols to indicate cliffs on their maps. Figure 4 is a section of a 1:50,000 scale French map of Tunisia. Here, the rim cliff of a flat-topped mesa is shown by means of a black line-hachure symbol instead of by contour lines. The symbol indicates the exact location of the rimrock ef-

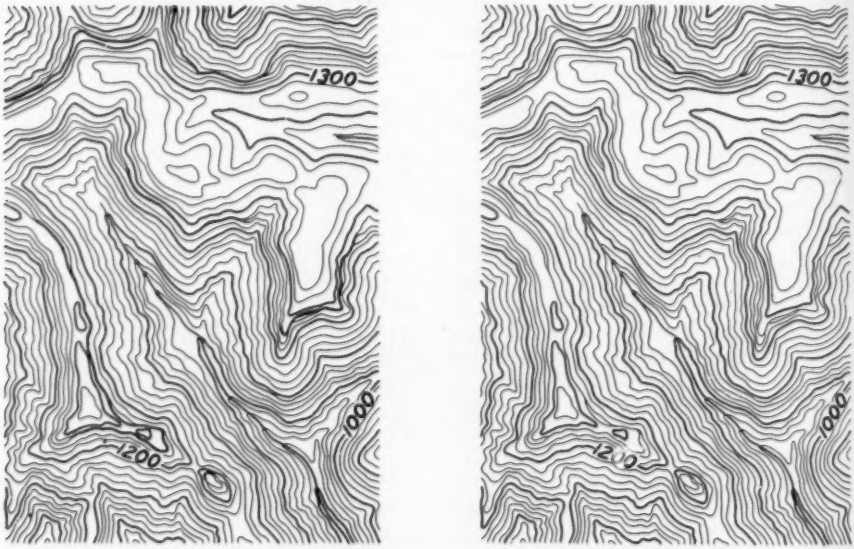


FIGURE 3.—Two sections of the same 1: 24,000 scale map, contour interval 20 feet. At right, cliffs are shown by carrying contours. At left, cliffs are shown by heavy black lines.

FIGURE 4.—A section of a 1: 50,000 scale map of Tunisia.. The escarpment around the flat-topped mesa is indicated by black hachures.

FIGURE 5.—Another section of the map used for figure 4, showing a water gap through a mountain range; black-line hachures indicate vertical rock walls.

fectively and conspicuously. This kind of topographic feature is very common in the desert areas of southwestern United States, and the treatment illustrated here would have a wide application if it were adopted.

ROUGH, BROKEN TERRAIN POORLY REPRESENTED BY CONTOURS

Another problem with contours is that they do not adequately portray rough, broken terrain. Mountains of jagged, barren rock are not well represented by contours alone because, even with the most careful compilation and drafting, the contour lines give the false impression that the ground surface is smoother than it actually is. Figure 5 illustrates the French approach to this problem.

This is a section of the same map used in figure 4. Here, black hachures—apparently overprinted on the brown—have been used to represent the cliff-like areas of exposed rock. On both sides of the water gap lighter line-hachure symbols are used to show the smaller rock escarpments. Near the bottom of the figure the banks of the wash are shown by brown hachures—the French do not draw reentrants for this type of drain. This treatment sacrifices the contour information to some extent in order to provide a clearer picture of the landscape and a map that is more easily understood. Where hachures are used to show rough, barren rock outcrops, generalized contours could also be shown. There are many areas in the mountains of western United States where this treatment could be used most effectively.

CONTOURS DEFICIENT IN AREAS OF EXTREME RELIEF

In areas where extremes of relief are encountered on a single map—common in much of the western United States—it is impossible to select a contour interval that is equally suitable for both the flat and steep areas. In this type of terrain, a contour interval that is appropriate for the flat areas causes the map to become "tight" or congested with contours on the nearby steeper slopes, and some of the intermediate contour lines must be feathered out and omitted

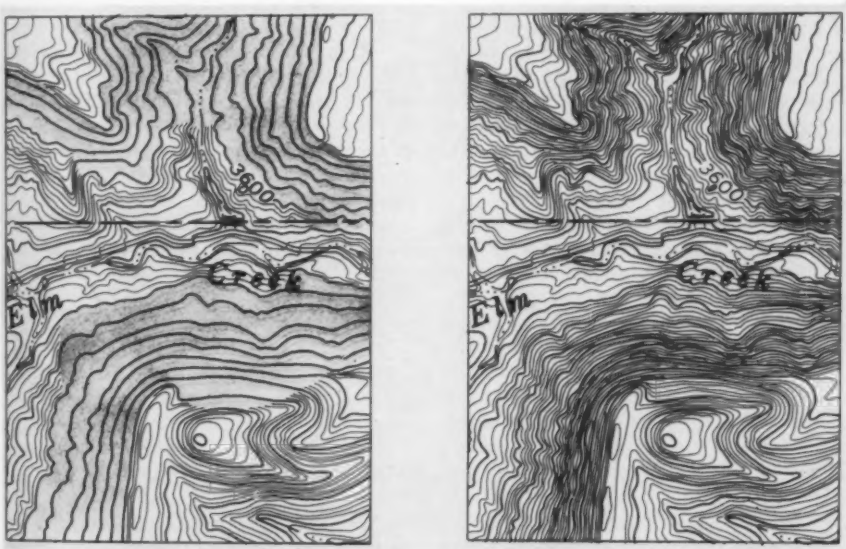


FIGURE 6.—At right, a section of a 1: 24,000 scale, 10-foot contour interval map of steep terrain using the conventional "feathering-out" treatment. At left, the slope-tint treatment is used for the same area.

from the map. The contouring in these places becomes a dense mass of brown lines that are costly to draft, and the resulting map is difficult to interpret. Wherever one or more of the intermediate contours are feathered or dropped out, the others have little value for indicating differences in elevation. Figure 6 shows an area near Hot Springs, S. Dak. Here a contour interval that gives a reasonable spacing of contours in the flatter areas leads to a tight and almost illegible congestion of contours on the steep canyon walls. On the right, the conventional method of feathering and dropping out some of the intermediate contours has been used. Since the intermediate contours have little elevation value in this treatment, the only effect of adding them is to improve the pictorial representation; to drop them out entirely would tend to destroy the impression of steepness. A suggested remedy is illustrated on the left side of figure 6. Here, only the index contours have been compiled and—in order to retain the impression of relief—the space between the index contours has been filled with a brown half-tone tint. The pictorial effect is about the same as on the right, where the contours have been feathered and dropped out, but in the slope-tint treatment the overall height of the canyon wall is more easily determined from the map, and the slope-tint treatment should be less expensive.

CONCLUSION

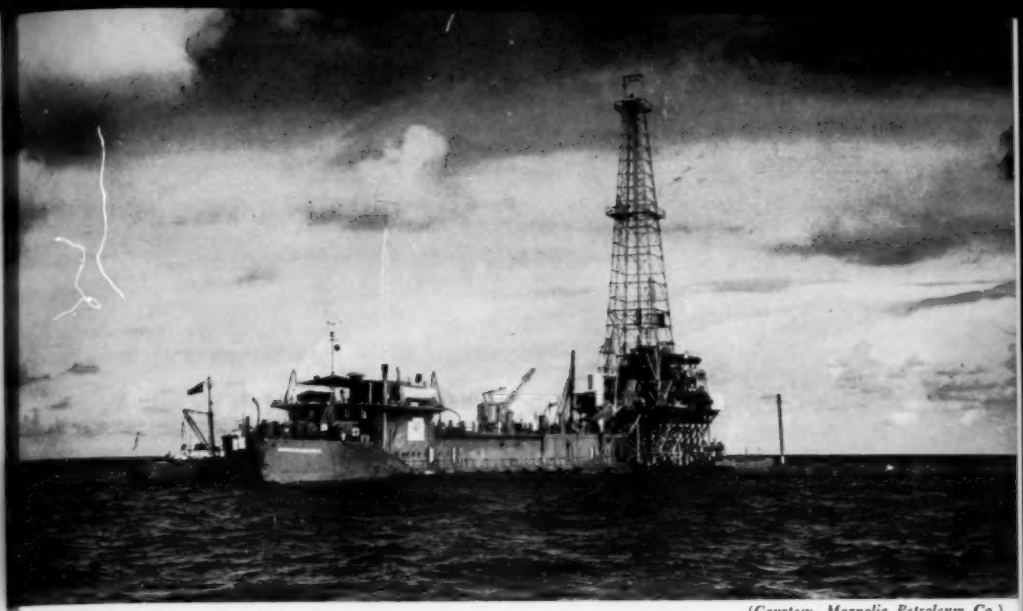
The Europeans have developed elaborate symbols that augment contour lines in portraying topographic features on their maps. The combination of hachures, contours, relief shading, and other symbols that they have devised gives a really pictorial representation of the terrain. It may be that some of these treatments, although commonly used by European mappers, are not really practical for general-purpose American maps because our program is concerned with the initial mapping of large areas. Then, too, we must realize that the use of special symbols and innovations requires special drafting skills, may be too expensive, and sometimes leads to serious problems in reproduction.

On the other hand, we must not hesitate to adopt new methods of depicting relief whenever it can be demonstrated that they would improve the quality of the map. Special symbols are a practical means for representing some types of topographic features without adding appreciably to the cost of map production. If symbols were adopted to show features that can now be shown only by using small contour intervals, larger contour intervals could perhaps be adopted and thereby substantially reduce the overall costs of the mapping program.

We all realize that the techniques of map production have improved considerably in the last 15 years, but the pictorial representation of the maps is just about the same as it was 75 years ago. Perhaps it is now time to give more thought to improving the pictorial quality. Certainly the American Congress on Surveying and Mapping provides an appropriate forum for the discussion and evaluation of new developments in this direction.

IMPROVED DIRECT ELEVATION LEVEL ROD

ACSM member A. S. Miller, civil engineer and land surveyor, informs that following a canvass of some fifty colleges for opinions, pro and con, on the use of direct elevation level rods, he decided to attempt design of an improved rod of this type, and, being successful, is now manufacturing them. Informative literature, including extracts from "50 College Opinions of Direct Elevation Rods" can be obtained on request from A. S. Miller, Paynesville, Minn.



(*Courtesy, Magnolia Petroleum Co.*)

DRILLING FOR OIL 25 MILES OFFSHORE IN THE GULF OF MEXICO IN 40 FEET OF WATER.

Boundary Problems Associated With the Continental Shelf

By A. L. SHALOWITZ
UNITED STATES COAST AND GEODETIC SURVEY

THIS PAPER might properly begin with the question "Where are the seaward boundaries of the United States?" In 1952, a congressional committee investigating the problem, reported as follows:

> Although our country is now 163 years old, no one can say exactly where our seaward boundaries are located. Along much of our coast line, it is impossible to say, even within a few miles where our territory ends and the high seas begin.[1]

This is a rather startling and surprising statement. The committee, however, did not come up with an answer.

In 1953, Congress enacted the Submerged Lands Act establishing titles in the States to the submerged lands within their historic boundaries. Also in 1953, the International Law Commission of the United Nations promulgated draft articles on the Regime of the High Seas, and in 1954 it promulgated provisional articles on the Regime of the Territorial Sea.

These developments in international and domestic law, particularly those aspects which deal with seaward boundaries, are of interest to the surveying and mapping profession, because in the final analysis it will be the surveyor and the mapmaker who will be called upon to delimit and demarcate such boundaries or provide the fundamental data from which they can be established.

To better understand these developments and their significance for us, it will be helpful to clarify first some of the fundamental terms generally associated with seaward boundaries.

Presented at the Fifteenth Annual Meeting, American Congress on Surveying and Mapping, Washington, D. C., March 9–11, 1955. The views expressed are those of the author and do not necessarily represent the views of the Coast and Geodetic Survey.

[1] HOUSE REP. No. 2515, 82d Cong., 2d Sess. 4 (1952).

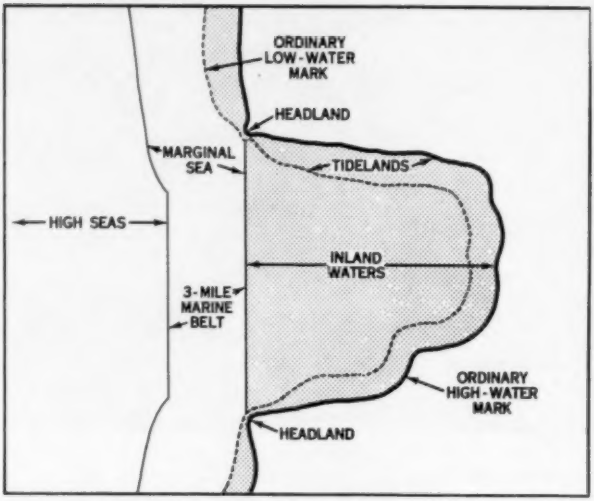


FIGURE 1.—Terminology used in delimitation of seaward boundaries.

Seaward of the land area of every coastal nation are three categories of water areas —termed inland waters, marginal sea, and high seas—each with its own significance in point of control which a coastal nation may exercise over it. (*See* fig. 1.) The *inland waters* include all bodies of water within the land territory, such as rivers and lakes, as well as bodies of water which open on the coast and fall within the category of "true" bays. Along a generally straight coast, without major indentations, it would also include the area subject to the flux and reflux of the tide, that is, between ordinary high-water mark and ordinary low-water mark. The common legal feature of all inland waters is that the nation concerned exercises complete sovereignty over them, the same as it exercises over its land territory. This sovereignty includes the right of exclusion of foreign vessels.

Seaward of the inland waters of a nation is the *marginal sea,* also called the "territorial sea" and the "marine belt." These waters form part of the national territory of the coastal nation, but foreign merchantmen, and perhaps foreign warships in time of peace, have the right of innocent passage through them, subject of course to the observance of special regulations laid down by the coastal nation for the protection of navigation, and the execution of municipal laws relating to customs, quarantine, and other local interests. Once the boundaries of the marginal sea have been determined, the territorial limits of a nation become automatically established.

Seaward of the marginal sea lie the *high seas.* Freedom is the characteristic notion used in connection with the high seas, which means they are not subject to the sovereignty of any one country, but every country has equal rights of user in them. This "freedom of the high seas" is today a dominating principle of maritime law, although, as we shall see, it is being modified, to an extent, by the developing continental shelf doctrine.

THE MARGINAL SEA AS A LEGAL CONCEPT

As a legal concept, the marginal sea is closely related to the doctrine of freedom of the seas. The early Roman jurists looked upon the sea as common to all mankind. Theirs was the doctrine of *mare liberum,* or free sea. With the development of commerce in the late Middle Ages, maritime nations began to claim exclusive control over parts of the open sea adjacent to their territories. These claims reached their height of extravagance toward the end of the 16th century, when Spain claimed the exclusive right of navigation in the Pacific Ocean, the Gulf of Mexico, and the western Atlantic; and Portugal asserted a similar right in the Atlantic south of Morocco, and in the Indian Ocean. There was little law recognized in this matter and each nation asserted such claims as seemed warranted in its own eyes, and obtained recognition

of them in proportion to its power to defend them. This was the doctrine of *mare clausum*, or closed sea.

By the close of the 17th century, there was a reversion to the Roman doctrine of freedom of the seas, and the right of free navigation won general acceptance. With this right to navigate the Seven Seas came an unwillingness on the part of nations to say that the free seas touched their very shores. The need for a maritime nation to exercise jurisdiction over the waters along its coasts, to some distance from shore, seemed a logical development in the interest of self-defense, or for the protection of neutral shipping in time of war. The early jurists were unable to agree on an exact distance because they failed to perceive any specific guiding principle. Finally, the "cannon-shot" rule was hit upon, that is, the distance from the shore that a nation could defend was the distance to which a cannon shot could be fired, and should be a measure of its jurisdiction. This seemed to capture the imagination of many 18th century writers and jurists, and was generally adopted. Since at that time the range of cannon was approximately a marine league, or 3 nautical miles,[2] this distance became the limit to which a coastal nation could exercise territorial jurisdiction. And thus originated the doctrine of the "3-mile limit."[3]

The cannon-shot concept became fairly well fixed in European jurisprudence, and during the 19th century Great Britain and the United States became the chief protagonists of the doctrine. Other maritime countries claimed wider belts—Norway and Sweden 4 miles, Spain 6 miles, Mexico 9 miles, and the Soviet Union 12 miles.[4] Thus far, no international agreement has been reached on a uniform distance. Whether the marginal sea concept arose as a principle of defense or of neutrality, it crystallized as a limitation on the freedom of the seas doctrine, rather than as a residuum of the closed sea doctrine.[5]

It is sometimes stated that developments in the science of ballistics have outmoded the 3-mile rule for the marginal sea. But this very reasoning becomes a potent argument against any radical change being made in this long-established concept. For if technological developments be the criteria for the width, then it would be necessary to establish a belt so wide as to constitute a serious encroachment on the high seas, and we would soon be reverting to the Medieval doctrine of the closed sea, not to mention the international conflicts that would ensue. At any rate, the width of the belt certainly has not kept pace with the increased range of coastal batteries nor with other modern implements of warfare, and this would also seem to raise a presumption in favor of the primacy of the freedom of the seas.

Thus, while the rule is preserved, the reason for the rule must be relegated to the limbo of obsolescence.

The doctrine of the free seas has been one of the keystones of American foreign policy. It is implicit in the position taken by Thomas Jefferson as early as 1793 when, as Secretary of State, he put forward the first official American claim for a 3-mile zone as the territorial limits of the United States. This position has never been departed from. It has been reaffirmed upon numerous occasions, and we have uniformly protested encroachment by other nations on this doctrine.[6]

[2] The international nautical mile is equal to 6076.10 feet or 1852 meters, and is 1.151 statute or land miles. The nautical mile is also called a geographical mile. A marine league is equal to 3 nautical miles or 3.453 statute miles.

[3] The name of Cornelius van Bynkershoek, a Dutch jurist, is perhaps most frequently associated with the cannon-shot rule. Recent research indicates, however, he was not the actual originator of the rule, but was, perhaps, the earliest jurist to record the existence of the rule. Walker, *Territorial Waters: The Cannon Shot Rule*, British Year Book of International Law (1945) 210. *See* also Kent, *The Historical Origins of the Three-Mile Limit*, 48 Amer. Journal of Int'l Law 537 (1954).

[4] For a comprehensive statement of the various claims of nations to a marginal sea and to contiguous zones, *see* Boggs, *National Claims in Adjacent Seas*, The Geographical Review 185, April 1951.

[5] Jessup, The Law of Territorial Waters and Maritime Jurisdiction 3–5 (1927).

[6] For a recent reaffirmation of this doctrine by the Department of State, *see* Tate, *Tidelands*

But, while adhering to the doctrine of freedom of the seas, nations have quite generally, if not universally, exercised some authority on the high seas adjacent to their territorial waters. Such extended jurisdiction is manifested principally in the fields of law enforcement and national security. Thus, in the United States, Congress, as early as 1799, passed an Act directing revenue officers to board vessels bound for a United States port when within 12 nautical miles of the coast, to determine the character of the cargo. This extended jurisdiction was also invoked in 1920, in connection with enforcement of the National Prohibition Act, and a number of treaties were negotiated with foreign powers which provided for search and seizure of vessels, when within an hour's run from shore, if they were suspected of violating the liquor laws. And, in the Declaration of Panama, the United States, together with other American Republics, proclaimed a security zone 300 miles wide for the protection of neutral commerce of the Americas during World War II.

These special cases of jurisdiction beyond a nation's territorial waters leave intact, nevertheless, the two basic tenets of the freedom of the high seas doctrine—the right of free navigation and the right of free fishing. These rights are inviolable and belong to the peoples of all nations.

DEVELOPMENT OF A CONTINENTAL SHELF DOCTRINE IN INTERNATIONAL LAW

Recently, the International Law Commission of the United Nations promulgated draft articles on the continental shelf, in which it seeks to establish sovereign rights in a coastal nation over the seabed and subsoil beyond the traditional limits of territorial waters. This developing doctrine will be examined in the light of the freedom of the seas concept, after which specific boundary problems raised by the newly enacted legislation dealing with offshore submerged lands of the United States will be considered.

What has given rise to this new continental shelf doctrine? One answer, and an obvious one, is the recognition that the continental shelf holds the key to a vast, new reservoir of natural resources which an ever-increasing world population will have to tap, as its land resources are materially reduced or as they become entirely exhausted. This, together with developments in technology, which made possible the location and actual recovery of offshore petroleum deposits, signalled the need for a legal regime to insure orderly and peaceful exploitation of these resources.

In terms of United States reserves, it is the opinion of geologists and petroleum engineers that the submerged lands of the continental shelf constitute the largest undeveloped source of oil under our control. These reserves are estimated as of the order of 14 billion barrels for the areas adjacent to California, Texas, and Louisiana, which at today's prices would approximate 40 billion dollars. The magnitude of this potential is further emphasized by the fact that the oil industry, on the Gulf coast alone, has invested approximately 500 million dollars in offshore oil. Recently, the Federal Government received 140 million dollars from leases of submerged lands off the coasts of Texas and Louisiana, and this represents but 3 percent of the area mapped as potentially oil-bearing.[7] So we are dealing with an economic venture of no mean proportion.

What is the Continental Shelf?

What is the continental shelf and what are some of its physical characteristics? Every continent rests on a so-called submarine base which extends seaward a varying distance from shore. To this submerged extension of the visible continent has been given the name "continental shelf." More specifically, it may be defined as the submerged margin of a continent, which slopes

Legislation and the Conduct of Foreign Affairs, DEPARTMENT OF STATE BULLETIN 486, March 30, 1953.

[7] *See* statement by Secretary of the Interior McKay, *Washington Post and Times Herald*, Jan. 2, 1955, p. K-20.

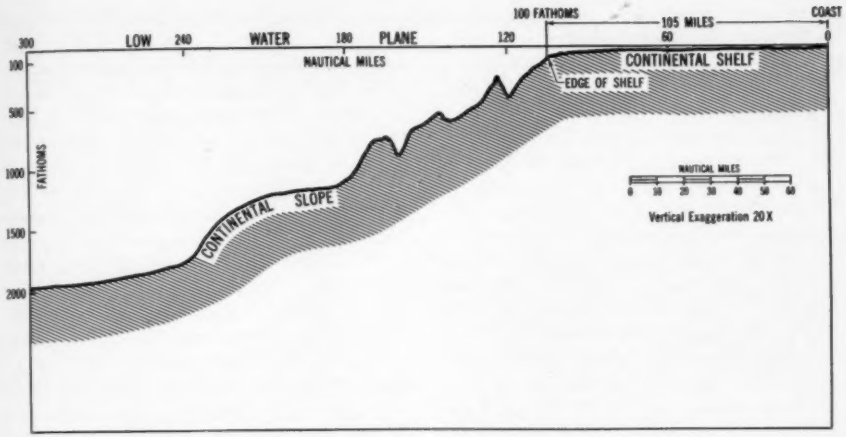


FIGURE 2.—Profile of shelf and slope in the Gulf of Mexico near the Louisiana-Texas boundary.

gently seaward to a point where a substantial break in grade occurs, at which point the bottom slopes seaward at a considerable increase in gradient until the great ocean depths are reached. The point of break defines the "edge" of the shelf, and the steeper sloping bottom the "continental slope." Actually, there is no sharp break between the shelf and the slope, but a gradual merging of the one into the other, so that the junction is a zone rather than a line. This is the true geologic-geographic concept. Conventionally, however, the edge of the shelf is taken as 100 fathoms or 600 feet. (*See* fig. 2.)[8]

The continental shelf is thus a worldwide geomorphological feature and is not peculiar to any one continent or to one hemisphere, although its distribution over the world is unequal. Thus, along the coast of Chile there is practically no shelf, while along the Siberian coast it extends for hundreds of miles from shore. An average width of 42 miles is sometimes given.[9]

Along the coast of the United States (fig. 3), the continental shelf varies from a width of about 1 nautical mile off parts of California to about 200 miles off Cape Cod. In the Gulf of Mexico, near the Texas-Louisiana boundary, it has a width of 120 miles. Figure 4 shows the bottom configuration of an area north of San Francisco Bay from the shore to oceanic depths. Note the closeness of the 100-fathom depth contours on the continental slope as compared with the distance from shore of the first 100-fathom contour. There is actually a drop of 600 feet in the first 14 miles from shore, and a drop of 10,000 feet in the next 21 miles.

The continental shelf should not be confused with the waters overlying it—one is a land mass, submerged it is true, but land nevertheless; the other is a water area, sometimes called the epi-continental sea. Figure 5 shows a profile of the shelf and slope for the area off the California coast shown in figure 4. The inset in the lower right-hand corner illustrates the relationship of the epi-continental sea to the continental shelf.

[8] In 1952, the International Committee on the Nomenclature of Ocean Bottom Features adopted the following definition for the continental shelf: "The zone around a continent, extending from the low water line to the depth at which there is a marked increase of slope to greater depth. . . . Conventionally its edge is taken at 100 fathoms (or 200 metres) but instances are known where the increase of slope occurs at more than 200 or less than 65 fathoms." BULLETIN, INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS 555, July 1953. (The world average has been estimated as 72 fathoms or 432 feet.)

[9] *See* world map accompanying *National Claims in Adjacent Seas, supra* footnote 4.

Figure 6 shows the rather remarkable submarine topography of the continental shelf and slope along the northeast coast of the United States. Many submarine canyons penetrate the shelf, the most pronounced being the one which marks the submerged gorge of the ancient Hudson River. Note the marked difference in the topography of the shelf as compared with the slope. The illustration is a photograph of a plastic relief model based on hydrographic surveys contoured at 5-fathom intervals for the shelf and 25-fathom intervals for the slope.

In considering the legal basis for a continental shelf doctrine, three characteristics of the shelf should therefore be kept in mind: (1) it is a land mass that underlies the marginal sea and the high seas; (2) it is a worldwide feature that varies considerably in extent; and (3) it is the submerged extension of the continents.

Legal Status of the Continental Shelf

The legal status of the seabed of the marginal sea presents no difficulty because the coastal nation has full sovereignty over the superjacent waters. But beyond the marginal sea lie the high seas, and the high seas are free to all nations. Does this mean that the same legal principle applies, or should apply, to the earth below these free waters? If not, then what legal rationale is to be applied? This leads to a consideration of the claims of nations in this field and of the findings of the International Law Commission.

Historically, the first step taken by coastal nations to appropriate the mineral resources beyond territorial waters was the Anglo-Venezuelan Treaty of 1942, under which the submerged area in the Gulf of Pária, separating the British Island of Trinidad from the mainland of Venezuela, was divided. But this was no more than a bilateral agreement and no claims to sovereignty were made as against other nations and no mention made of a continental shelf.

The real impetus to present-day legal developments was President Truman's Proclamation of September 28, 1945, in which he announced to the world that the natural resources of the continental shelf contigu-

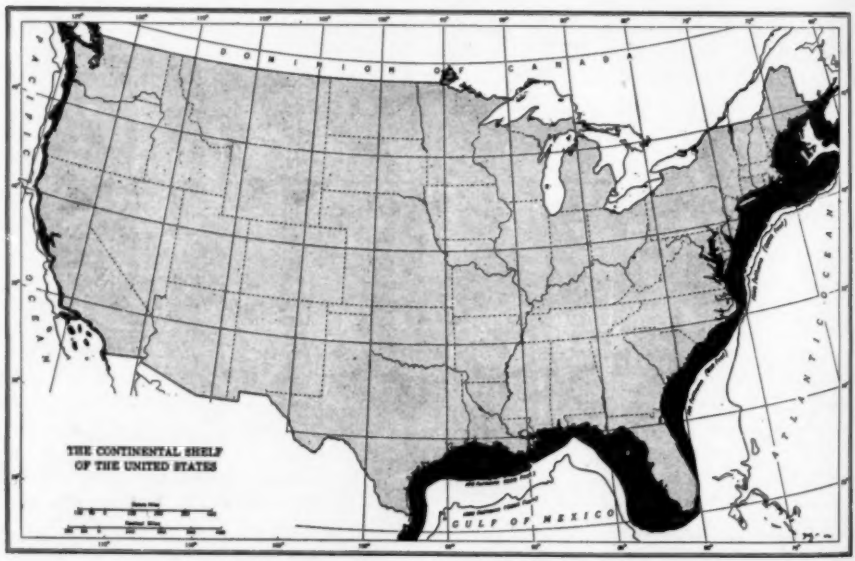


FIGURE 3.—Continental shelf along the coasts of the United States.

ous to the coasts of the United States were to be regarded "as appertaining to the United States, subject to its jurisdiction and control." The preamble to the Proclamation states that it is the view of the United States that such exercise of jurisdiction by the contiguous nation is reasonable and just, "since the continental shelf may be regarded as an extension of the land-mass of the coastal nation and thus naturally appurtenant to it." The Proclamation concludes with a declaration that the character as high seas of the waters above the shelf, and the right to their free and unimpeded navigation are in no way affected.[10]

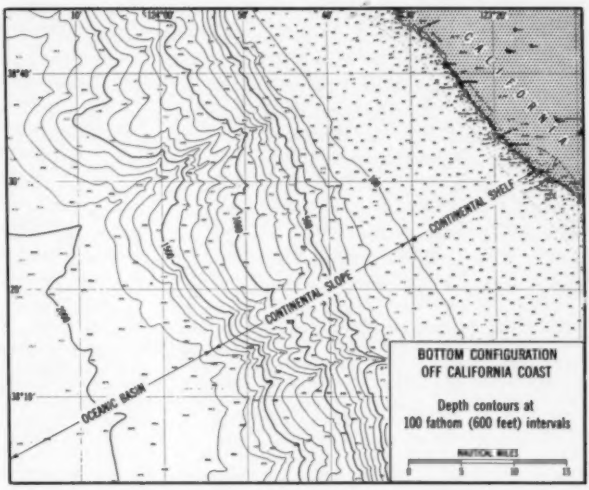


FIGURE 4.—Bottom configuration off California coast north of San Francisco Bay.

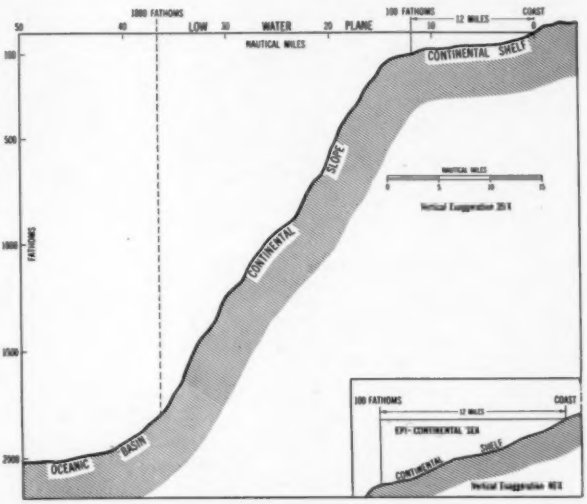


FIGURE 5.—Profile of shelf and slope along California coast at latitude 38° 35′. (*See* fig. 4.)

Now when the United States lays claim to the subsoil and seabed of an area three times the size of France, as it did under this proclamation, it is indeed a major development in foreign affairs. Early suggestions that the proclamation violated international law were largely discounted by the chain reaction of claims which it precipitated amongst other nations, particularly those of Latin America, many of the claims going far beyond the United States declaration in both purpose and scope. In a number of cases, the claim has been converted into one of actual sovereignty over the shelf, and at least five nations have framed their claims to include the water areas above the shelf. The broadest claim made thus far has been the effort by at least four nations to establish zones of resources control 200

[10] Exec. Proc. No. 2667, 59 STAT. 884 (1945).

miles wide, irrespective of the width of the contiguous shelf, and one has actually declared such zone to be part of its national territory. A substantial majority of the claims provide that there be no diminution of the traditional right of free navigation over the superjacent waters.[11]

These claims, including the United States claim, were all unilateral in nature and had no binding force on the international community other than the voluntary respect that nations chose to accord them, or as the nations involved were able to enforce. It was therefore natural, in a situation as explosive as this, that the United Nations, through its International Law Commission, should seek to bring order out of the existing chaotic condition.[12]

Faced with this *de facto* situation, the Commission, after 3 years of detailed study and prolonged discussion, adopted draft articles in 1953 on the regime of the continental shelf.[13] It spells out that a coastal na-

[11] For a detailed statement on the various claims of the American States, *see* Young, *The Continental Shelf in the Practice of American States*, INTER-AMERICAN JURIDICAL YEARBOOK 27 (1950–1951). A more comprehensive analysis of these and other claims is contained in MOUTON, THE CONTINENTAL SHELF 63 *et seq.* (1952), and in ANNINOS, THE CONTINENTAL SHELF AND PUBLIC INTERNATIONAL LAW 45 *et seq.* (1953).

[12] The International Law Commission is an organ of the United Nations General Assembly charged with the codification and development of international law. The Commission, composed of 15 eminent international lawyers and jurists, meets for several months annually and reports its conclusions and recommendations to the General Assembly for consideration.

[13] REP., INT'L LAW COMM., 5th Sess. 12 *et seq.* (1953) and recorded in Official Records, U. N. General Assembly, 8th Sess., Supp. No. 9 (1953) (U. N. Doc. A/2456).

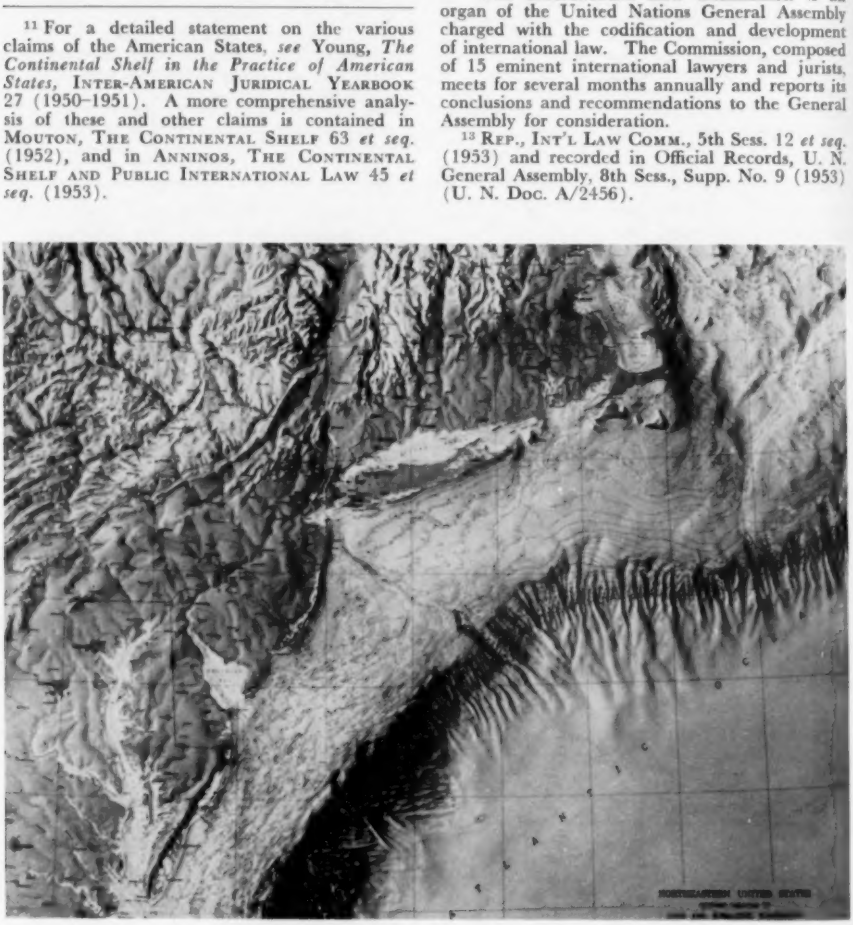


FIGURE 6.—Submarine topography of shelf and slope along northeast coast of the United States. (After Veatch and Smith.)

tion exercises sovereign rights over the shelf for the purpose of exploring and exploiting its natural resources. It defines the shelf as "the seabed and subsoil of the submarine areas contiguous to the coast, but outside the area of the territorial sea, to a depth of two hundred metres" (109 fathoms or 654 feet).[14]

The Commission rejects the doctrine of *res communis* (the property of all nations) and the doctrine of *res nullius* (the property of no one) as being impracticable when applied to the land under the high seas. It adopts instead the principle of *ipso jure* (by the law itself) as the basis for the rights of a coastal nation over the continental shelf. And this it holds to be independent of occupation, actual or fictional, and of any formal assertion of such rights. But the rationale on which this holding is based is the geographical unity of the submerged areas with the non-submerged continguous land. The Commission thus adopts, to an extent, the geographical and geological test for the continental shelf as the basis for the juridical concept of the term, but it does not necessarily hold that the existence of a continental shelf in its geographical sense is essential to the exercise of the rights of a coastal nation. Nor does it rule out the possibility of equitable modifications of the general rule being made in certain geographic situations. The draft articles are thus partly in the nature of a codification of existing practices of nations, and partly in the nature of a development of international law.[15]

Under the Commission's recommendations, the seaward boundary of a coastal nation takes on a three-dimensional character. At the outer limit of the marginal sea or territorial sea (fig. 7), it is defined by the vertical plane (*A*) rising from the sea floor through the superjacent waters and the airspace above for an indefinite height. From plane (*A*) the boundary is the inclined plane (*B*) of the continental shelf extending seaward until the 200-meter isobath is reached, after which it becomes the descending vertical plane (*C*) penetrating into the subsoil for an indefinite distance.

In profile, the boundary would appear as shown in the inset in the upper left-hand corner of figure 7.

The Continental Shelf Doctrine and Freedom of the High Seas

The question might be asked, Does the new continental shelf doctrine mean that we are receding from the principle of freedom of the high seas? Theoretically, any restriction on the use of the high seas, no matter how slight, would be a recession from the principle. But practically, it becomes a matter of the balancing of interests. The "free seas" developed when navigation and fisheries were the primary economic interests associated with the open sea. The paramount consideration was the need of the international community. New interests have now arisen that are equally important to the community of nations. What yardstick is then to be applied in assessing the relative importance of the interests involved?

The International Law Commission, while holding that the continental shelf doctrine is subject to, and within the orbit of, the paramount principle of freedom of

[14] The adoption of the 200-meter depth contour instead of the 100-fathom contour is due to the use of meters as a depth unit for nautical charts by the great majority of maritime nations. BOWDITCH, AMERICAN PRACTICAL NAVIGATOR 42 (1943). *See* also *The Metric System*, INT'L HYD. REV. 45 (Nov. 1925). As a practical matter the use of 200 meters (109 fathoms) in place of 100 fathoms will result in only a slight difference horizontally, inasmuch as this depth in general will fall on the continental slope.

[15] The 1953 draft articles differ in two important respects from those promulgated by the Commission in 1951. "Sovereign rights" of the coastal nation is now substituted for "jurisdiction and control," and the test of jurisdiction is no longer made to depend upon the ability to exploit the natural resources. While there is something to be said in favor of the principle of competence on the ground of flexibility, and this principle had the support of the United States, the Commission, in its final draft, adopted a fixed legal edge because of its belief that the exploitability rule does not satisfy the requirement of certainty which is essential in any legal concept. REP., INT'L LAW COMM., *supra* footnote 13, at 13.

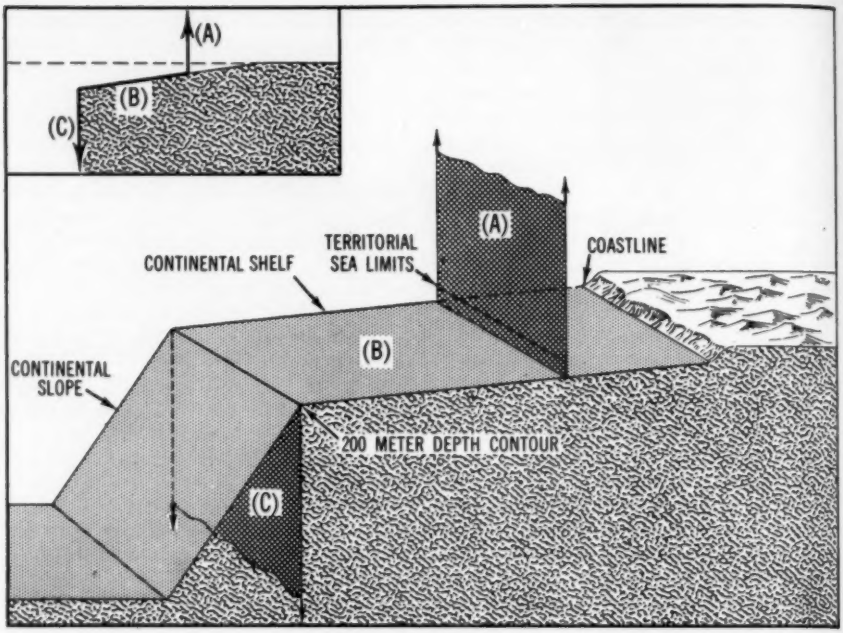


FIGURE 7.—The three-dimensional character of a seaward boundary. (After Moodie.)

the seas, nevertheless points out that "the progressive development of international law, which takes place against the background of established rules, must often result in the modification of those rules by reference to new interests or new rules." It therefore formulates the general test of "unjustifiable interference" as the basis for invoking the full rigidity of the freedom of the seas principle. Under this test, the construction of installations on the continental shelf would be sanctioned in the interest of mankind, as long as the interference with free navigation can be justified. But such construction in narrow channels or in recognized sea lanes essential to international navigation is expressly prohibited.[16]

This, then, is the present international situation. What, now, is the United States picture?

THE UNITED STATES PICTURE

By two legislative enactments, Congress has provided the machinery for the exploration of the natural resources of our continental shelves. Public Law 31, 83d Congress, 1st Session (identified as the Submerged Lands Act, and approved May 22, 1953), establishes titles in the States to lands beneath navigable waters within their historic boundaries;[17] and Public Law 212,

[16] REP., INT'L LAW COMM., *supra* footnote 13, at 12, 13 and 15. Some apprehension has been expressed regarding the effect of extending sovereignty over the continental shelf on freedom of oceanographic research at sea. The Governing Board of the National Academy of Sciences Research Council took cognizance of this on June 20, 1954, and adopted a resolution urging that "the traditional freedom of scientific research at sea be protected by international agreement." *See* NEWS REPORT (National Academy of Sciences, National Research Council) 57, July-August 1954.

[17] 67 STAT. 29 (1953). Historic boundary refers to the boundary of a State at the time it "became a member of the Union, or as heretofore approved by Congress." *Id.* at Section 2(a)(2).

83d Congress, 1st Session (identified as the Outer Continental Shelf Lands Act, and approved August 7, 1953), provides for jurisdiction by the United States over the submerged lands seaward of the State boundaries as defined in the Submerged Lands Act.[18] The Federal boundary is thus coterminous with State boundaries. (*See* fig. 8.) But before the States can know the seaward extent of their jurisdiction and the Federal Government the landward extent of its jurisdiction, the boundaries of the States will have to be ascertained. Are these susceptible of finite determination from the language of the Act?

PROBLEMS OF DELIMITATION

Two types of problems are usually associated with boundary making—problems of delimitation and problems of demarcation. Delimitation refers to the definition of the boundary as given in treaties and statutes and generally involves problems of interpretation before the boundary can be laid down on a map or chart; demarcation refers to the actual laying down of the boundary on the ground and its definition by monuments.[19] This discussion deals primarily with delimitation problems.

Repeated references are made in Public Law 31 to the boundaries of the States as extending 3 geographical miles *from the coast line*.[20] Basic to a determination of the

[18] 67 STAT. 462 (1953).

[19] BOGGS, INTERNATIONAL BOUNDARIES 32 (1940).

[20] The Act (Sections 2(a)(2), 2(b), and 4) also provides that States bordering the Guf of Mexico may assert a claim to a boundary up to 3 marine leagues (9 geographical miles), if it was so provided by its constitution or laws prior to or at the time such State became a member of the Union, or if it has heretofore been approved by Congress. Figure 8 shows the relative areas of Federal and State jurisdiction, under Public Laws 31 and 212, for a section of the Gulf

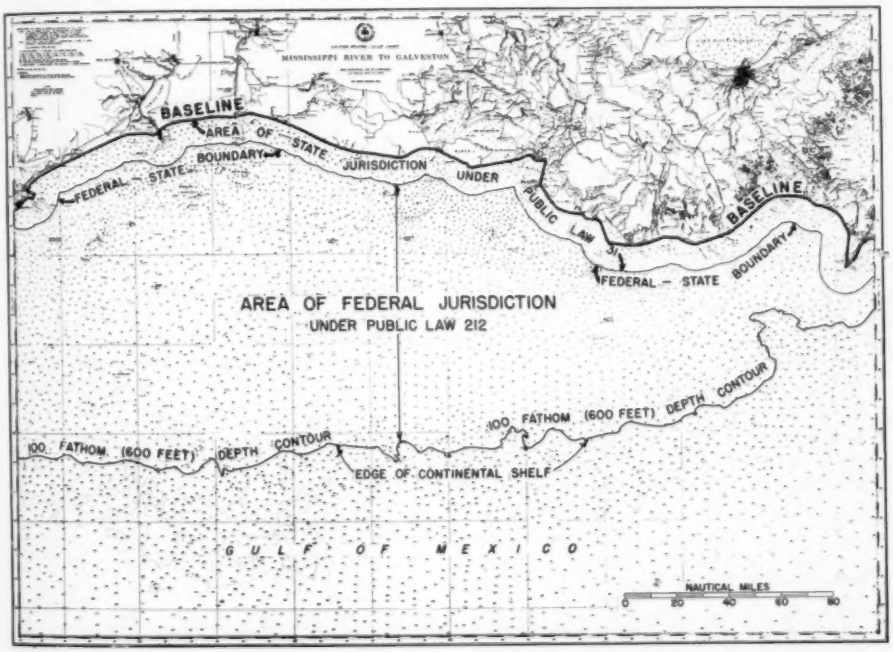

MISSISSIPPI RIVER TO GALVESTON
BASELINE
AREA OF STATE JURISDICTION UNDER PUBLIC LAW 31
FEDERAL — STATE BOUNDARY
BASELINE
FEDERAL — STATE BOUNDARY
AREA OF FEDERAL JURISDICTION
UNDER PUBLIC LAW 212
100 FATHOM (600 FEET) DEPTH CONTOUR
100 FATHOM (600 FEET) DEPTH CONTOUR
EDGE OF CONTINENTAL SHELF
G U L F O F M E X I C O
NAUTICAL MILES
0 20 40 60 80

FIGURE 8.—Relative areas of State and Federal jurisdiction under Public Laws 31 and 212, respectively. (*See* footnote 20.)

Federal-State boundary is thus an understanding of the term "coast line" as used in the Act. The crucial language is contained in Section 2(c) which defines "coast line" as "the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters." This specifies generally the baseline from which the State boundaries are to be measured and is the same as the term "baseline" used in international law for designating the line from which the marginal sea is measured. (*See* fig. 1.) But does the definition provide adequate criteria for delimiting, with legal and technical certainty, the boundaries of the States? Obviously, it does not. Where, for example, are the seaward limits of inland waters in the case of indentations? Would it be a headland-to-headland line, or would the limits follow the sinuosities of the indentation; and, if the former, would there be a limitation on distance between headlands? And how is the definition to be applied where islands fringe a coast at varying distances from the mainland? Would the State boundary, whatever it may be, be measured from the line of low water along the mainland coast or from the outer island coast? Even the matter of "ordinary low water" will require interpretation. If applied to the Pacific coast, where successive low waters fall to different levels during a tidal day, the question arises which of the lows should be used. These and other matters are left unsettled by the Act. How then are they to be resolved?

It is a cardinal rule of statutory construction that the intent of the legislative body, expressed or implied, governs in the interpretation of language. This intent may be inferred from the legislative history of an Act, and from the circumstances surrounding its enactment. Implicit in the legislative history of Public Law 31 is the desire on the part of the sponsors to change the law of Federal paramount rights in the submerged lands of the open sea which the Supreme Court laid down in the so-called "tidelands" cases.[21] Equally implicit is the desire to leave the question of boundary determinations for future adjudication or agreement.[22] Within this framework, it is appropriate, then, to develop interpretive guides based on historical precedents in the judicial, legislative, and executive fields.

If the Submerged Lands Act replaces the Federal paramount rights doctrine, then it must of necessity apply to the submerged lands of the marginal sea, control over which the Supreme Court said is a function of national external sovereignty. Therefore, in interpreting the boundary provisions, we may be guided by the principles of delimitation which the United States has traditionally adhered to in the conduct of its external affairs.

This traditional position was considered by a Special Master, named by the Supreme Court, in the case of *United States* v. *California,* to interpret the broad terms of the Court's decree and to apply it to the California coastline.

The language of Public Law 31 relating to "coast line" is singularly similar to that used by the Court in the *California* case, so that the boundary problems raised by the Act are not unlike those considered by the Special Master. Although his recommendations have not yet been finalized by the Court,[23] his findings represent the nearest approach thus far made in this country to a judicial determination of the inland

coast. A 9-mile State boundary is shown, being the maximum allowable under Public Law 31, and the baseline is an interpretation of the recommendations of the Special Master in the *California* case (*see* footnote 23 *infra*); however, neither of the lines should be considered definitive, since both are subject to future modification, based on accurate surveys, and on interpretive criteria to be adopted.

[21] The cases of United States v. California, 332 U.S. 19 (1947); United States v. Louisiana, 339 U.S. 699 (1950); and United States v. Texas, 339 U.S. 707 (1950) established the doctrine of Federal, rather than State, paramount rights in the submerged lands of the open sea, seaward of the inland waters of the States.

[22] 99 CONG. REC. 2620 (1953).

[23] The Report of the Special Master (dated Oct. 14, 1952) was ordered filed Nov. 10, 1952. 344 U.S. 872 (1952).

waters and associated boundary problems and, in the absence of legislative guidance, should provide a basis for an interpretation of the boundary provisions of Public Law 31.[24]

The Inland Waters Problem

The first problem to be considered is the establishment of criteria for determining the seaward limits of inland waters. In the delimitation of the marginal sea, the United States has traditionally taken the position that the baseline—the line that separates inland waters from marginal sea—is the low-water mark following the sinuosities of the coast.[25] This fundamental "rule of the tidemark," as it is called, would be applicable to a relatively straight coast or where slight curvatures exist. Major indentations, however, present special problems of national interest, and it is well established in international law that such embayments form exceptions to the rule of the tidemark, and the baseline follows a headland-to-headland line, thus making the indentation part of the inland waters of a nation. What is not so well established is the yardstick to be used in determining the dividing line between a slight curvature and a major indentation.

In 1910, the Permanent Court of Arbitration at The Hague laid down the rule that:

> In case of bays, the three marine miles are to be measured from a straight line drawn across the body of water at the place where it ceases to have the configuration and characteristics of a bay. At all other places the three marine miles are to be measured following the sinuosities of the coast.[26]

But the Tribunal left unsettled the important question of how to determine the kind of indentations that possess the "configurations and characteristics" that would bring them into the category of inland waters. This remained for future technicians to grapple with.

The difficulty that would be encountered in the practical application of the principle laid down by The Hague Tribunal is illustrated by a consideration of the California coastline (fig. 9). Undoubtedly, indentations such as San Francisco Bay and San Diego Bay would possess the configurations and characteristics contemplated by the Tribunal and would be inland waters. But would the same apply to Halfmoon Bay, to Monterey Bay, to Estero Bay, and to Santa Monica Bay? And if not, then where is the dividing line?

An attempt to answer this question was made in 1930 when The Hague Conference for the Codification of International Law was convened. The United States delegation proposed a geometrical method which took into account the extent to which an embayment penetrated the land area, or more precisely the ratio of the penetration to the dimension of the entrance. It was called the "semicircular method" because the theoretical bay which is on the borderline between a true bay and a slight curvature was taken to be that of a semicircle.[27]

The genesis and development of this method, together with a French proposal, are discussed in considerable detail in the article "The Concept of a Bay as Inland Waters" in the October–December 1953 issue of SURVEYING AND MAPPING, and I do not wish to repeat what I said there. It will suffice here to say that in applying the rule

[24] The lines established by the United States Coast Guard, pursuant to the Act of Feb. 19, 1895, 28 STAT. 672 (1895), has sometimes been mentioned as establishing the seaward limits of inland waters. However, in United States v. Newark Meadows Improvement Co., 173 Fed. 426, 428 (1909), it was held that such lines divide the areas along our coasts where the Inland Rules of the Road apply from the areas where the International Rules apply and have no application other than the specific purpose of determining what rules of navigation should be followed.

[25] *See* Tate, *supra* footnote 6, at 486.

[26] I NORTH ATLANTIC COAST FISHERIES ARBITRATION, *Award* of the Tribunal, at 96–98 (1910). For a full discussion of this arbitration, *see* JESSUP, *supra* footnote 5, at 363–382.

[27] *See* 3 Acts of the Conference for the Codification of International Law (League of Nations Publications V:Legal) 218 (1930).

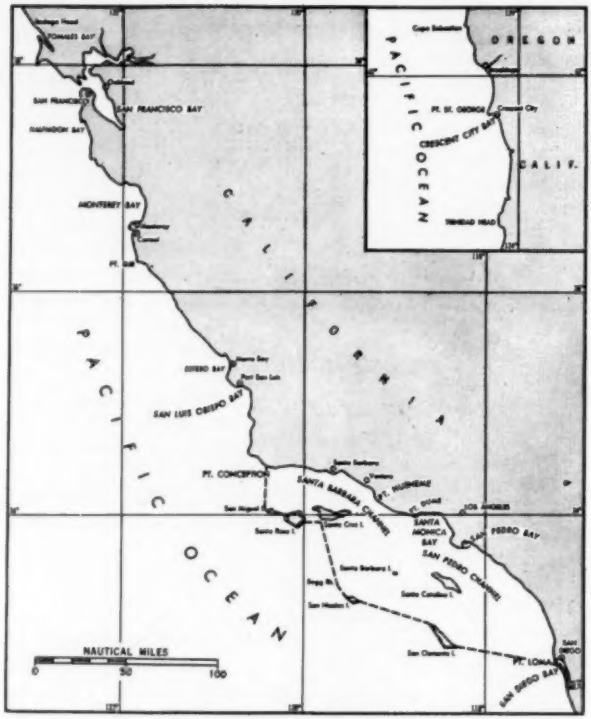


FIGURE 9.—Portion of California coastline.

to an indentation (*see* fig. 10), whose status is to be determined, a semicircle is constructed at the entrance with the headland-to-headland line as a diameter. Then, if the area of the indentation is *less* than the area of the semicircle, as is the case with indentation *DCE,* the indentation is part of the open sea and the marginal sea would be measured from the ordinary low-water mark following the sinuosities of the coast. But if the area of the indentation is *greater* than the area of the semicircle, as is the case with indentation *DBE,* then it is part of the inland waters and the marginal sea is measured from the headland-to-headland line *DE.*

In the *California* case, the Special Master recommended the use of this geometrical formula, not as an established general rule of international law nor even as the traditional position of the United States, but as "an appropriate technical method of ascertaining whether a coastal indentation has sufficient penetration into the land area to constitute inland waters."[28]

The 10-Mile Rule.— Closely related to the problem of determining the seaward limits of inland waters at indentations is the question whether there should be a limitation on the distance between headlands. The United States in its diplomatic representations has adhered to the so-called 10-mile rule, a doctrine limiting the inland waters of a bay to a distance of 10 nautical miles at the entrance. In other words, in the case of indentations wider than 10 nautical miles, a straight line is drawn across the indentation at the first point nearest the entrance at which the width does not exceed 10 nautical miles, and the semicircular formula then applied. This line would be the maximum seaward extent of inland waters. (*See* fig. 11.)

A basis for the rule has sometimes been stated to be the elimination of fishing hazards that would result from a strict application of a 3-mile marginal belt to an indentation. Since the encroachment upon the marginal sea by fishing vessels is generally a grave offense, involving in many instances the forfeiture of the offending vessel, it has been thought expedient not

[28] Report of Special Master, United States v. California, Sup. Ct. No. 6, Original, Oct. Term, 1952 (cited hereinafter as Final Report of Special Master), at 26.

to allow it where the extent of free waters, between the 3-mile line drawn on each side of the bay, is less than 4 miles.[29]

Under this theory of the rule, the distance limitation on bays would depend upon the width of the marginal sea and would be equal to twice its width plus 4 nautical miles. Thus, countries claiming a 6-mile belt would have a 16-mile limitation on bays, those claiming 9 miles would have a 22-mile limitation, etc.

Another basis for the rule is that, equally with the 3-mile limit, it has resulted from the impact of the doctrine of the freedom of the seas on claims to maritime territory by coastal nations. Under this theory, the 10-mile limit is regarded as an essentially independent rule that has established itself empirically in international practice as the reasonable and practical limit for bays rather than by any process of deduction from the 3-mile limit.[30]

In the *California* case, the Special Master found that the 10-mile rule had had a considerable background in the practice of nations and that the United States has traditionally recognized such limitation on bays.[31]

Insofar as Public Law 31 is concerned, the provision which allows States bordering the Gulf of Mexico to assert a claim to a boundary of 9 miles from the coast line,

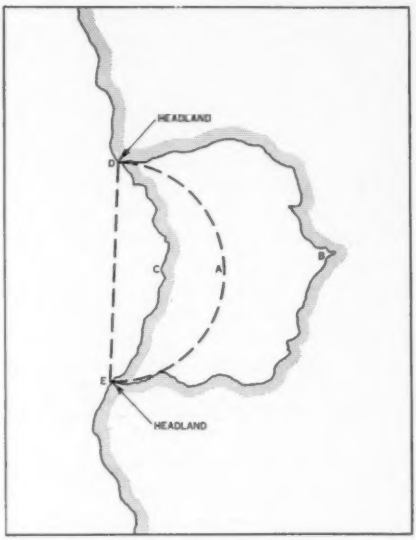


FIGURE 10.—Application of semicircular method.

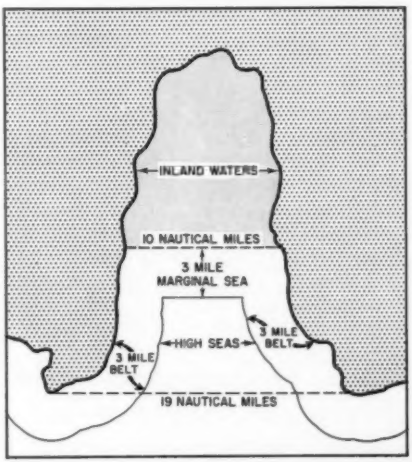


FIGURE 11.—Application of 10-mile rule to an indentation.

[29] *See* JESSUP, *supra* footnote 5, at 355–356.

[30] A Committee of Experts meeting at The Hague in April 1953, under the aegis of the International Law Commission of the United Nations, to study problems in connection with the delimitation of the territorial sea, adopted, subject to the approval of the Commission, a 10-mile limitation on bays, stating: "The closing line across a (juridical) bay should not exceed 10 miles in width, this being twice the range of vision to the horizon in clear weather, from the eye of a mariner at a height of 5 meters." *See* Report of the Committee of Experts on Technical Questions Concerning the Territorial Sea (1953) (U. N. Doc. A/CN. 4/61/Add. 1/Annex).

[31] Final Report of Special Master, *supra* footnote 28, at 21. In the century-long North Atlantic Fisheries dispute with Great Britain over the meaning of the Treaty of 1818 (*see* footnote 26 *supra*), the United States took the position that inland waters were limited by the 3-mile marginal belt rule to bays not more than 6 miles wide at the entrance, that is, to twice the 3-mile limit. On recommendation of the Arbitration Tribunal, however, the 10-mile rule was accepted by the United States as a proper limitation on the sweeping headland-to-headland doctrine contended for by Great Britain.

under certain specified conditions, would not be affected under either theory of the 10-mile rule, as long as the United States adheres internationally to the 3-mile limit.

The Offshore Islands Problem

Another aspect of the "coast line" problem that will require interpretation is the case where islands fringe a coast at various distances from the mainland. Is a State's seaward boundary to be measured from the mainland coast or from the outer island coast? In other words, is the status of the straight separating the islands from the mainland, inland waters or open sea? Public Law 31 is silent on this point and no congressional intent can be inferred from the legislative history other than a desire to leave the question where Congress found it.

Here again we may look for guidance in the position taken by the United States in its international relations and as expressed in diplomatic correspondence.[32] In the *California* case, the Special Master found the traditional position of the United States to be that where islands or groups of islands fringe a coast, and the strait between the mainland and the offshore islands connects two seas having the character of high seas, then each is to be surrounded by its own marginal belt. (*See* fig. 12.) He noted that the rule of the tidemark (*see* text at footnote 25 *supra*) "in itself excludes the idea of drawing the coastline from headland to headland around offshore islands,"

[32] The position of the United States relative to islands and straits may be summarized as follows: (1) Where islands or groups of islands lie off the coast, irrespective of their distance from the mainland, each island is to be surrounded by its own marginal belt; (2) where a strait between the mainland and offshore islands connects two seas having the character of high seas, the waters of the strait are not to be considered as inland waters and the marginal sea is to be measured as described under (1); and (3) where a strait

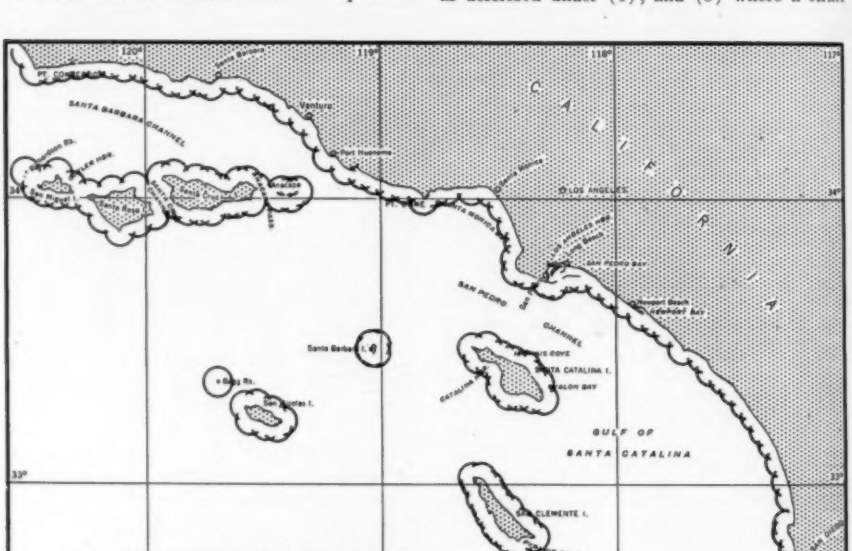


FIGURE 12.—Delimitation of the marginal sea in the vicinity of islands.

and stated that placing a 3-mile marginal belt around each offshore island goes naturally with the fact that the "islands are part of the territory of the nation to which the mainland belongs."[33] On this basis, he found the channels and other water areas between the mainland and offshore islands off the southern California coast not to be inland waters.[34]

The question naturally arises whether the findings by the Special Master with regard to offshore islands and to the 10-mile rule contravene international law, particularly as exemplified by the decision of the International Court of Justice in the *Anglo-Norwegian Fisheries* case,[35] and whether the decision requires any change in the traditional position of the United States.

In upholding Norway's method of delimiting an exclusive fisheries zone by drawing straight baselines along the seaward projections of the outermost of the numerous islands, islets, and rocks (about 120,000 in all) that constitute the so-called "rock rampart" of the Norwegian coast, the Court found that this method was part of a traditional "Norwegian System," which had been acquiesced in by other nations. It took cognizance of the unique geography of the Norwegian coast and held that Norway's method did not violate international law, notwithstanding the fact that some of the baselines spanned water areas 18 to 44 miles across.[36]

The decision does not, however, make it obligatory upon a coastal nation to adopt the sweeping Norwegian method of drawing straight baselines between widely separated islands, just as its holding that the 10-mile rule "has not acquired the authority of a general rule of international law" does not stand for the doctrine that the adoption of such a limitation is contrary to international law. This is implicit in the Court's statement that "the coastal State would seem to be in the best position to appraise the local conditions dictating the selection."[37] It follows, *a fortiori,* that any method that exhibits a more liberal approach to the problem *vis-a-vis* the family of nations would not infringe customary law. There is, therefore, no conflict between the holding in the *Fisheries* case and the recommendations of the Special Master in the *California* case.[38]

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is merely a channel of communication to an inland sea, the rules regarding bays apply. *See* Letter of Nov. 13, 1951, from Acting Secretary of State to Attorney General, printed in Brief for the United States before the Special Master, 167–73 (May 1952), United States v. California, Sup. Ct., No. 6, Original, Oct. Term, 1951.

[33] Final Report of Special Master, *supra* footnote 28, at 26–27. This view is supported by JESSUP, *supra* footnote 5, at 66–67.

[34] The islands are separated from the mainland by 10 to 60 nautical miles with depths in between as great as 6,000 feet. It was California's position that the marginal belt should be measured not from the physical coastline of California but from an "exterior" or "political" coastline drawn by a series of straight lines from Point Conception around the outermost offshore islands to Point Loma at San Diego Bay (*see* fig. 9). This contention was bottomed on considerations of history, physical and geographic factors, use and occupancy of the area, national security, and the status of international law in this field.

[35] Judgment of Dec. 18, 1951: I. C. J. Rep. 1951, p. 116.

[36] *Id.* at 127. The Court nevertheless carefully circumscribed the conditions under which straight baselines may be drawn. For example, it said: (1) "the drawing of baselines must not depart to any appreciable extent from the general direction of the coast"; (2) "the choice of baselines is in effect whether certain sea areas lying within these lines are sufficiently closely linked to the land domain to be subject to the regime of internal waters"; and (3) "certain economic interests peculiar to a region, the reality and importance of which are clearly evidenced by a long usage," should not be overlooked. *Id.* at 133.

[37] *Id.* at 131. This was the position taken by the Government following the pronouncement in the *Fisheries* case, and successfully urged in the *California* case. *See* Letter of Feb. 12, 1952, from the Secretary of State to the Attorney General, printed in Brief for the United States before the Special Master, *supra* footnote 32, at 173–75.

It is of interest also to note that in the hearings before the Special Master, evidence was introduced by the Government to show that the relation of land (comprising the islands) to water area off the Norwegian coast is 1 to 3½, while in the case of the islands off California it is 1 to 29.

[38] In the provisional Articles concerning the Regime of the Territorial Sea, the International Law Commission took cognizance of the *Fisheries* decision regarding the drawing of straight base-

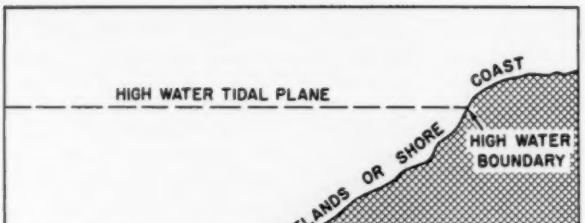


FIGURE 13.—Intersection of tidal planes with shore.

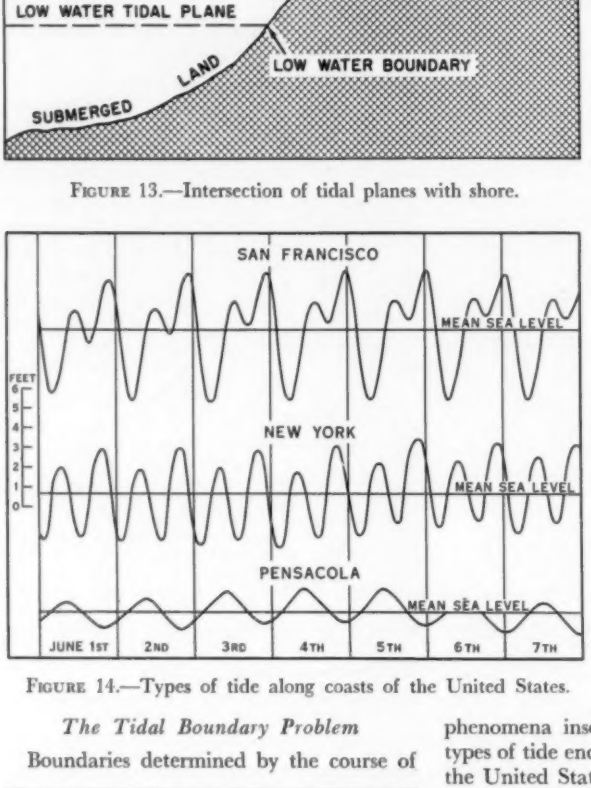


FIGURE 14.—Types of tide along coasts of the United States.

The Tidal Boundary Problem

Boundaries determined by the course of the tides involve two engineering aspects: a vertical one, predicated on the height reached by the tide during its vertical rise and fall, and constituting a tidal plane; and a horizontal one, related to the line where the tidal plane intersects the shore to form the boundary desired. (*See* fig. 13.) The first is derived from tidal observations alone and, once derived (on the basis of long-term observations), is for all practical purposes a permanent one. The second is dependent on the first, but is also affected by the natural processes of erosion and accretion, and the artificial changes made by man.

As stipulated in Public Law 31, the coastline from which the seaward boundaries of the States are to be measured is the "line of ordinary low water." But the term "ordinary" lacks the technical precision that is required in the establishment of tidal boundaries and raises problems of interpretation that require an analysis of tidal phenomena insofar as they pertain to the types of tide encountered along the coasts of the United States. (*See* fig. 14.) For example, along the Pacific coast, the tide exhibits a marked diurnal inequality—that is, successive high waters rise to different levels and successive low waters fall to different levels. The question therefore arises whether to use an average of the lower low waters, the higher lows, or all the lows. The seaward boundaries would extend farther in-

lines, where islands fringe a coast, without regard to the "rule of the tidemark," but with modifications as to distance from the mainland coast and as to distance between islands, based on the recommendations of a Committee of Experts (*supra*, footnote 30). REP., INT'L LAW COMM., 6th Sess. 14 (1954), Regime of the Territorial Sea (Article 5), recorded in Official Records, U. N. General Assembly, 9th Sess., Supp. No. 9 (1954) (U. N. Doc. A/2693).

shore or farther offshore, depending upon the plane used.

Tidal boundaries are not new in American jurisprudence. The early grants, charters, and conveyances, which constitute the first links in the chains of titles on which the present ownerships of lands along our seacoasts are based, contain such phraseology as "high-water line," "high-tide line," "line of ordinary high water," and similar phrases pertaining to a low-water datum. These references are at best indefinite and reflect an oversimplification of a phenomenon inherently complex. Decisions interpreting such references sometimes contain imperfections, which suggest that appropriate scientific data may not have been made available to the court. *Teschemacher* v. *Thompson,* 18 Cal. 11 (1861) is a case in point. The court there said:

> The limit of the monthly spring tides is, in one sense, the usual high water mark; for, as often as those tides occur, to that limit the flow extends. But it is not the limit to which we refer when we speak of "usual" or "ordinary" high water mark. By that designation we mean the limit reached by the *neap tides;* that is, those tides which happen between the full and change of the moon, *twice in every twenty-four hours.* (Emphasis added.)

From the language quoted it is impossible to be certain what the court had in mind. Neap tides are those which occur when the moon is in quadrature, that is, at right angles to the sun. This happens *twice every month* when the moon is in its first and third quarters. The range of the tide at such times is less than the average, and high water does not rise as high nor low water fall as low as usual.[39]

The case of *Borax Consolidated* v. *Los Angeles,*[40] decided by the Supreme Court in 1935, established the first precise standard for interpreting the term "ordinary high-water mark" in connection with a Federal grant in the inner harbor of Los Angeles. The Court there held that in determining ordinary high-water mark, neither the spring tide nor the neap tide is to be used, but a mean of all the high tides, thus ruling out the higher highs only and the lower highs only. It accepted the Coast and Geodetic Survey's definition of the term "mean high water" at any place as being "the average of all the high waters at the place over a considerable period of time."[41]

If used in the same context, this decision should be authority for interpreting the cognate term "ordinary low-water mark" as the average of all the low waters, rather than the average of the higher lows only, or the lower lows only.

This was the recommendation of the Special Master in the *California* case. He predicated his finding on the consideration of property rights, stating that from the point of view of a disputed real estate boundary line, there would "be no more reason to choose the mean of the lower low tides (as one interested claimant might suggest from self-interest) than to choose the mean of the higher low tides (as self-interest might likewise move the other claimant to suggest)." In his view, the middle way, that is, the mean of all the low tides, would seem to be the only choice of which neither contestant could justly complain. This, he believes, is also the effect of the *Borax* decision with regard to "ordinary high water."[42]

As applied to Public Law 31, this finding would seem to afford a yardstick for at least an abstract interpretation of the term "ordinary low water." But a distinction must be noted between the two situations. In the *California* case, the line of ordinary low water was the actual Federal-State boundary; in Public Law 31, it is not the boundary line but the baseline from which the seaward boundaries of the States are to be

[39] SCHUREMAN, TIDE AND CURRENT GLOSSARY 25, Special Publication No. 228, U. S. Coast and Geodetic Survey (1949). The cognate term "spring tides" is applied to those tides which happen when sun, moon, and earth are in line. They also occur twice each month, taking place at the times of new and full moon. The tides then rise higher and fall lower than during the rest of the month. *Id.* at 34.

[40] 296 U. S. 10 (1935).

[41] MARMER, TIDAL DATUM PLANES 86, Special Publication No. 135, U. S. Coast and Geodetic Survey (1951).

[42] Final Report of Special Master, *supra* footnote 28, at 39–40.

measured, and is the same baseline from which the marginal sea is measured. In these circumstances, and in the absence of any choice having been made by the United States in its international relations,[43] some guidance in this matter may be had from the provisional articles on the Regime of the Territorial Sea, promulgated in July 1954, in which it is recommended that the low-water line as marked on the largest-scale official chart of the coastal nation be used for measuring the limits of the marginal sea.[44] On the Pacific coast of the United States, the mean of the lower lows is used as the reference plane for the nautical charts.

The Seaward Boundary Problem

Thus far, we have been considering the resolution of boundary problems with respect to the landward base. Unlike the *California* case, Public Law 31 also poses problems associated with seaward boundaries. These fall into two categories: (1) a determination of the outer boundaries of the States, and (2) a determination of the lateral boundaries between the States. As in the case of the landward base, there is nothing in the Act, nor in the legislative history, that provides a guiding principle for the solution of these problems.

Exterior boundaries—The Envelope Line.—While various methods are sometimes mentioned in the literature for delimiting the outer limits of the marginal sea, the method proposed by the United States at the 1930 Codification Conference merits the most serious consideration.[45] (*See* fig. 15.) Technically, it consists of drawing a line every point of which is a fixed distance (the width of the marginal sea) from the nearest point of the low-water line. Such line is constructed by swinging arcs from points along the low-water line, the most seaward arcs forming the outer limits of the marginal sea. It is called an "envelope line" because it envelops, so to speak, all arcs that fall short of it, as for example, the arcs drawn from the indentation in the left-hand portion of the figure. Geometrically, it is the locus of the center of a circle of fixed radius, the circumference of which is always in contact with the low-water line or with the seaward limits of inland waters. Although often referred to as the "arcs of circles method" because of the manner in which the line can be drawn, it will occasion less confusion if thought of in its geometric sense, that is, as a derivative of the coast line.

The envelope line possesses the unique feature that only one such line can be drawn from a given coastline, so that even though no actual line is charted, a navigator would have no difficulty in determining whether he is in the marginal sea or on the high seas. Having plotted his position on his chart, he describes an arc to landward with a radius equal to the width of the marginal sea: If the arc cuts land or inland waters, he is in the marginal sea; if it just touches, he is exactly on the boundary; and if it fails to touch at all, he is on the high seas. (*See* fig. 16.)

The envelope line was adopted by the International Law Commission in 1954 as an appropriate method for drawing the outer limit of the marginal sea, and would seem to be applicable to the delimitation of the seaward boundaries of the States.[46] However, in applying it to the context of Public Law 31 and Public Law 212, it may be desirable, in the interest of simplified leasing procedures, as well as for identification purposes, to adopt, within the framework of the envelope line, a straight-line approach to the delimitation problem. Such a line would in reality be a jurisdictional line, and would not be the actual boundary of the territorial limits of the United States, insofar as international law is concerned.

Lateral Boundaries—The Equidistant Line.—Delimitation of the seaward lateral

[43] *Id.* at 42.

[44] *See* REP., INT'L LAW COMM., *supra* footnote 38, at 14 (Article 4).

[45] *See* 3 Acts of the Conference, *supra* footnote 27, at 197.

[46] *See* REP., INT'L LAW COMM., *supra* footnote 38, at 15 (Article 6).

boundaries between adjacent States under Public Law 31 poses the same problem as delimitation of the lateral boundaries between adjacent coastal nations through the marginal sea and through the high seas to the outer edge of the continental shelf. The objective in all such delimitations is to apportion the area in such manner as will be equitable to both countries or to both States. This principle of equity was embodied in the Presidential Proclamation of 1945 (*supra* footnote 10). But to proclaim an abstract principle is one thing, and to formulate a working rule is quite another.

If coastlines were relatively straight, and the land boundary between adjacent nations reached the shore at right angles, the problem of delimiting the lateral boundary would be a simple one—an extension seaward of the last land frontier would be the logical solution. But coastlines are rarely straight, and land boundaries seldom reach the shore at right angles. Figure 17, for example, illustrates a condition where an extension of the land boundary through the marginal sea would clearly be inequitable for "Country *A*" because it would deprive it of a portion of the marginal sea that clearly belongs to it. The

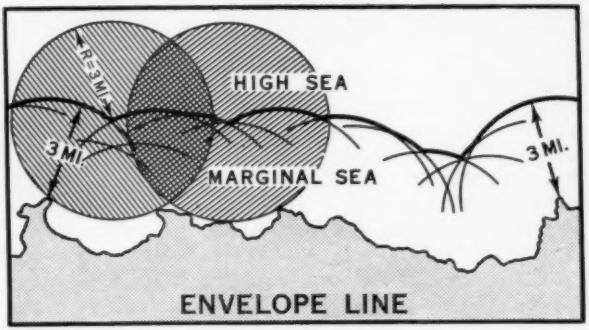


FIGURE 15.—Principle of the envelope line.

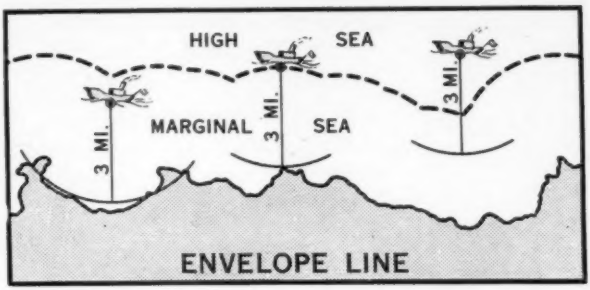


FIGURE 16.—Use of envelope line in practice.

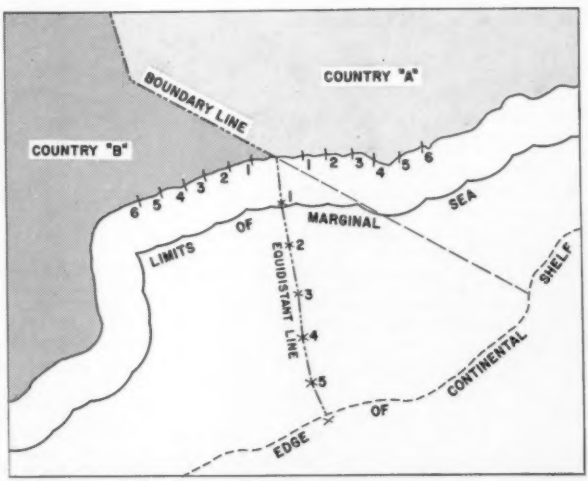


FIGURE 17.—The principle of equidistance in drawing lateral boundaries.

inequity would be intensified as the line is extended seaward to the edge of the continental shelf.

Other solutions sometimes proposed are: drawing a line at right angles to the general direction of the coast, or using as a dividing line the parallel of latitude or the meridian of longitude of the point at which the land boundary meets the coast.

The International Law Commission rejected these methods as impracticable for a general rule of law, although suitable in special situations. It adopted instead the "principle of equidistance" as the basis for drawing the lateral boundary between adjacent countries through the territorial sea, "in the absence of agreement or unless another boundary line is justified by special circumstances."[47] The latter proviso would definitely include exceptional configurations of a coast, which might require a modification of the principle.

Figure 17 shows one method of applying the principle of equidistance to a coastline from the shore to the edge of the continental shelf. With the shore terminus of the land boundary as a center, intercepts are drawn at equal intervals on the coastline of each country. Arcs are then swung seaward from corresponding intercepts with radii equal to the distance between them. The intersection of corresponding arcs form points on the lateral boundary.

There may be other ways of adhering to the principle of equidistance, and this aspect of the problem requires further study.

These principles, or some adaptation thereof, would appear to afford criteria for interpreting those portions of Public Law 31 and Public Law 212 that pertain to lateral boundaries.[48]

SUMMARY

To summarize, then, adoption by the International Law Commission of draft articles on the Regime of the Continental Shelf marks a major forward step in the development of an orderly and peaceful basis for the exploration by nations of the natural resources contiguous to their coasts. National sovereignty is established within the orbit of the paramount principle of freedom of the seas. If the recommendations of the Commission are accepted by the United Nations General Assembly, a source of possible friction will have been removed from the international scene.

On the national level, passage by Congress of the Submerged Lands Act and the Outer Continental Shelf Lands Act has clarified generally the status of these areas in relation to Federal and State jurisdiction. But neither of the Acts provide criteria for determining with engineering certainty the specific areas of jurisdiction. Nor has the validation by the Supreme Court of the Submerged Lands Act remedied these defects.[49] These remain for future adjudication or agreement. On the Atlantic and Pacific coasts, the problem will be primarily one of establishing criteria for interpreting the baseline from which the seaward boundaries of 3 nautical miles are to be measured. This will involve problems not unlike those considered by a Special Master in the case of *United States* v. *California*, and his recommendations, together with the draft

[47] REP., INT'L LAW COMM., *supra* footnote 38, at 17 (Article 16). This follows the principle adopted by the Commission for delimiting lateral boundaries through the continental shelf. The latter, however, contains the additional provision that disputes should be submitted to arbitration. To that extent the rule partakes of some elasticity, but any arbitral solution must be conceived within the framework of the principle of equidistance. REP., INT'L LAW COMM., *supra* footnote 13, at 13, 15–16. No arbitral provision is at present drafted for the delimitation of lateral boundaries in the territorial sea, since the Commission has decided to hold over all provisions relating to this subject. REP., INT'L LAW COMM., *supra* footnote 38, at 17 (comment on Articles 15 and 16).

[48] For a comprehensive discussion of Public Law 212, *see* Christopher, *The Outer Continental Shelf Lands Act: Key to a New Frontier*, 6 STANFORD L. REV. 23 (1953).

[49] Alabama v. Texas, 347 U. S. 272, 273 (1954). In a brief *per curiam* opinion, the Court held that "The power of Congress to dispose of any kind of property belonging to the United States 'is vested in Congress without limitation' " and that "Congress not only has a legislative power over the public domain, but it also exercises the powers of the proprietor therein" and "may deal with such lands precisely as a private individual may deal with his farming property."

articles of the International Law Commission, should provide at least an approach to a resolution of this phase of the boundary problems.

On the Gulf coast, there will be the additional problem of determining which of the States are entitled, under the provisions of Public Law 31, to a seaward boundary of 9 nautical miles, and the extent to which such provision is valid as against other coastal States and as against other nations.

From a surveying and mapping point of view, there will be the matter of the actual location of the line of ordinary low water and the seaward limits of inland waters, as well as the seaward boundaries of the States, with an accuracy commensurate with the specialized nature of the problem. A survey of the low-water line at indentations, together with islands and reefs at the entrance, will be necessary for a determination of the status of such indentations, that is, whether inland waters or open sea. Along a generally straight coast, the condition of reefs and rocks (with respect to the chart datum) will have to be ascertained so as to provide a baseline for delimiting the seaward boundaries of the States.[50] Finally, intensive mapping of the topography of the continental shelf, together with oceanographic surveys of the superjacent waters, may be required as a base for future exploration of this vast, but relatively untapped, reservoir of natural resources.

With these problems of delimitation and demarcation resolved, we should not be at a loss to provide an answer to the question "Where are the seaward boundaries of the United States?"

[50] The actual survey of the low-water line will involve vertical ties to established bench marks and horizontal ties to existing triangulation. In some areas, such as along the Gulf coast, additional triangulation will be required, as well as additional control tide stations to furnish an adequate datum. Once these fundamental data are determined, the mapping of the low-water line can be accomplished by photogrammetric or by other methods, or by a combination of methods. The difficulty in many areas will be getting on the ground with the proper data, from which the low-water line can be established.

Mutual Interest of Surveyors and Right-of-Way Men

IN AN ADDRESS at a dinner meeting in San Diego at which a San Diego group became affiliated with the Los Angeles Chapter No. 1 of the American Right-of-Way Association, Frank C. Balfour, National Chairman of the American Right-of-Way Association, said, in part:

> If we desire to maintain professional status, obviously we must endeavor to operate as professional men. . . .
>
> The very foundation on which the American Right-of-Way Association was created and exists is *education*—better education of our land-acquisition members to the end that they are better equipped to serve their employers, and at the same time, to more efficiently and honestly protect the property owners who are affected by our operations.
>
> As of this date, there is not a single university or college in the United States that gives a full four-year course to properly educate and train young men to accept positions in the right-of-way profession.
>
> The only education program that is being carried on in this Nation to train and assist right-of-way men . . . is by the American Right-of-Way Association, and this condition exists notwithstanding the fact that public and quasi-public right-of-way and land-acquisition men are confronted, during the calendar year 1954, with a program of acquiring lands and rights in land that will exceed 7 billion dollars in expenditures.

The pages of SURVEYING AND MAPPING have often voiced, in almost the same words, the same problems with respect to professional standing and education of surveyors. There appear to be strong reasons, then, why the American Right-of-Way Association and ACSM, having similar problems and parallel objectives, should work together in mutual interest toward professional standing, better education, and more and better surveys and maps.

Relevement

By PAUL E. WYLIE

DEPARTMENT OF ENGINEERING, UNIVERSITY OF CALIFORNIA AT LOS ANGELES

RELEVEMENT is a method for the solution of the three-point problem. Although it involves no tedious or elaborate computation, it is capable of determining the coordinates of the unknown instrument station, *I*, to whatever accuracy the data warrant. It is thus an accurate method, suited to high-grade triangulation systems. The method seems to have been introduced into this country by French artillery officers who were sent to the United States as instructors during World War I.

Relevement employs this technique: one selects an approximate position, as near as possible to *I*; then, one calculates by how much, and in what direction, the original guess was in error. The numerical work of correction can be done on the slide rule.

In the following description of the method, we shall assume the existence of a rectangular grid. Azimuths will be expressed relative to *Y*-north; *X* and *Y* coordinates will be given in feet. If no rectangular grid exists, it will be easy to improvise one.

The original estimated position of the theodolite (the assumed position, *AP*) is selected by reference to a map, or by a plane-table approximate solution of the identical problem. The *X* and *Y* coordinates of *AP* are noted. *AP* is not the true point; it is a point on the ground, of known coordinates, situated in the vicinity of the true point, *I*, where the instrument stands and at which the angles between the known points are measured.

Having selected the assumed point *AP*, compute the *Y*-azimuths and the distances to *AP*, from each of the known points *A, B,* and *C*, using the known coordinates of the points *A, B, C,* and *AP*. These *Y*-azimuths must be computed to at least the same precision as that of the measured angles *AIB* and *BIC*, which are measured by the theodolite with the instrument located at *I*. The distances, however, need be known only roughly, and may be computed on the slide rule. All of this involves only straightforward solutions of right triangles. (*See* fig. 1.)

On a sheet of paper (fig. 2) prepare a large-scale plot including only the immediate vicinity of *AP*. Put *AP* near the middle of the sheet. Adopt a direction for the *Y*-meridian, also a linear scale for the map. Draw, with a protractor, from *AP*, lines in the directions of *A, B,* and *C*, respectively.

If lines *AI, BI,* and *CI* could be drawn from *A, B,* and *C*, respectively, in their true orientation, they would intersect in the point *I*. The exact orientation of these lines is, however, unknown. In this situation, let us assume at first that one of these lines to *I* does have the same azimuth as has the line from the same station to *AP*. (This assumption is one of convenience only; any line of approximately the same azimuth would serve as well, although less conveniently.) Now, *on this assumption,* find the *Y*-azimuths of the other two lines toward *I*, by applying the angles measured at *I*. If, for example, we assume that the line *AI* has the same *Y*-azimuth as does the line *A-AP*, then the corresponding assumed azimuth of the line *BI* may be found by applying to the assumed azimuth of *AI* the value of the measured angle *AIB*; similarly, the assumed azimuth of *CI* may be found by applying to the assumed azimuth of *BI*, just determined, the value of the measured angle *BIC*.

If the plot of figure 2 were large enough, there could be drawn, from the plotted positions of *A, B,* and *C*, lines in the directions determined in the manner just described, and these lines would intersect, not in a point, but, due to the error in the azimuths assumed, in a triangle. The actual plot of figure 2 is limited to an area lying immediately adjacent to *AP*. To plot short segments of lines—segments long enough to show the triangle of error—on figure 2, it

will be necessary to find out how far the line *AI* lies to one side of the plotted line *A-AP*, in the vicinity of *AP*; and the same for the lines from *B* and *C* to *I*. To discover this, first find the difference in *Y*-azimuth between *A-AP*, *B-AP*, and *C-AP*, and

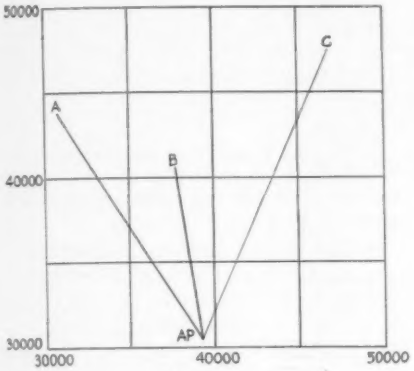


FIGURE 1.

the corresponding assumed azimuths of the lines from *A*, *B*, and *C*, to *I*. (On the basis of the usual assumption, one of these differences will be zero.) Express the several differences in seconds of arc. Call this difference (say for the line *BI*) d_B'', and the distance (for the same line), D_B, then the assumed line *BI* will lie to one side of the line *B-AP*, at a perpendicular offset distance equal to

$$\frac{D_B d_B''}{206265}$$

and will be parallel to *B-AP* (1 radian = 206265″). The same facts apply to the lines from *C*. Whether the offsets are to the right or the left is determined by comparison of the assumed azimuths to *I* and the corresponding computed azimuths to *AP*. The offsets need not both be to the same side.

The foregoing method of offsetting involves the assumptions that the line *B-AP* (for example) is parallel to the line *BI*, and that the distance *BI* is equal to the distance *B-AP*. Theoretically, neither of these assumptions is true; the errors, however, are negligible.

It thus becomes possible to lay out segments of the assumed lines *AI*, *BI*, and *CI* on the large-scale plot, and to discover the triangle of error in their intersection. (*See* triangle *ac*, *bc*, *ab* in figure 2.)

Having drawn this triangle, it remains to discover the change in orientation of the lines *AI*, *BI*, and *CI* which will reduce the triangle of error to a point. This point will be the true position, according to the scale of the plot, of *I*. The following facts will help:

1. The true point, *I*, is on the same side of each line.
2. The perpendicular distance by which an assumed line will be moved, parallel to itself, on account of a change in its assumed azimuth, is proportional to the length of the line, and also to the amount of the change in azimuth.
3. Any azimuth change must be the same in amount for all three lines.
4. All triangles of error (for slightly differing orientations) that lie on one side of *I* are similar. The lines joining corresponding vertices of

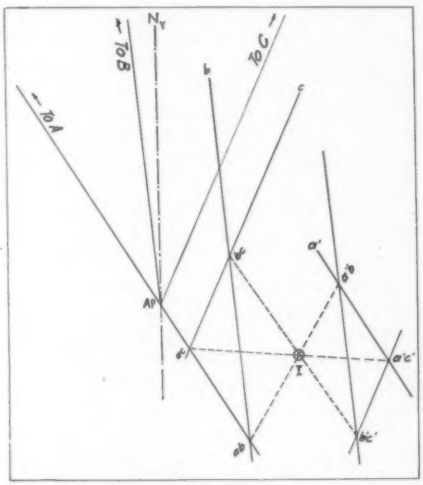


FIGURE 2.

all such triangles of error, whether lying on the same side of *I* or not, intersect in the true point, *I*.

No attempt should be made to guess the exact change in orientation which will reduce the triangle of error to a point. The change may be arbitrary. It should be

large enough so that the corresponding vertices will not be too close together. One change in orientation, combined with fact 4, above, should determine the position of *I* on the plot, from which its coordinates may be determined by scaling with reference to *AP*. There is advantage in "over-correcting" (as we shall do in the following example). When an over-correction is applied, fact 4 is still true. The point *I* will then lie between two facing triangles, instead of on the same side of each of them, and the corresponding vertices are as far as possible from each other—a fact leading to an accurate result.

In computing the offsets for the line segments which form the second triangle (but not the first), it is evident that the angle change corresponding to the offset distance may, if desired, be ignored. One might simply adopt an offset, in feet, for one of the lines. The other offsets will be in the same proportion, to this offset, as the length of the line involved is to the length of the line to which the original offset is applied.

In practice, more than 3 well-established points may sometimes be seen from *I*. This makes possible many independent solutions for the position of *I*. Some of the theoretically possible combinations of points will be rejected because of acute intersections or for other reasons. If the remaining solutions do not all give the same plotted position of *I*, the most probable position for *I* will be at the position, on the plot, of the center of gravity of the plotted positions. It is obvious that different weights may be assigned to the several plotted points without complicating the process of finding the center of gravity.

Like most other semi-graphical methods, relevement is much easier to perform than to explain. The method in practice is simple, fast, and accurate.

EXAMPLE

Given

Three points (*A*, *B*, and *C*, figure 1) whose coordinates are known, viz.,

	$x = 30977.3$	$x = 38397.8$	$x = 46978.2$
A:		*B*:	*C*:
	$y = 43703.6$	$y = 40619.8$	$y = 47179.8$

The approximate point is taken as:

	$x = 39378.2$
AP:	
	$y = 30243.8$

The angles measured at *I* are:

angle $AIB = 26° 32' 01''$

angle $BIC = 29° 35' 30''$

Required

To find the coordinates of *I*.

Solution

1. Find the *Y*-azimuths and lengths of the lines *A-AP*, *B-AP*, and *C-AP*. Since this work involves simple solutions of right triangles, only the results are given, as follows:

Line	*Y-azimuth*	*Length*
A-AP	148° 01′ 47″	15870
B-AP	174 36 09	10420
C-AP	204 10 05	18560

The *Y*-azimuths are computed using 6-place tables. The distances are computed on the slide rule.

2. Start the plot (fig. 2). Use the scale of 5 feet equals 1 inch. Let *A-AP* coincide with *AI* as a first approximation.

Y-azimuth *A-AP*	148° 01′ 47″
Angle *AIB*	26 32 01
Assumed *Y*-azimuth *BI*	174° 33′ 48″
Y-azimuth *B-AP*	174 36 09
Difference, to left	2′ 21″ = 141″
Assumed *Y*-azimuth *BI*	174° 33′ 48″
Angle *BIC*	29 35 30
Assumed *Y*-azimuth *CI*	204° 09′ 18″
Y-azimuth *C-AP*	204 10 05
Difference, to left	47″

3. Compute the offsets for the first error triangle.

Let x = the required offset distance in feet
D = the distance from the point (identified by subscript) to *AP*.

Then

$$\frac{x}{D} = \frac{\text{specified angle change in seconds}}{206265}.$$

For the line from *B*,

$$x_B = \frac{10420 \times 141}{206265} = 7.12 \text{ ft. to the left.}$$

And for the line from *C*,

$$x_C = \frac{18560 \times 47}{206265} = 4.22 \text{ ft. to the left.}$$

4. Plot these lines at the above computed perpendicular distances, parallel to the lines *B-AP* and *C-AP*, respectively. There is no offset, under our assumption, from the line *A-AP*. Draw the triangle of error. (Its sides are marked with the lower case letters, *a*, *b*, *c*, in figure 2.)

5. Plot a second error triangle. The offsets to establish this triangle are to be measured from the sides of the first error triangle.

Try offsetting the line from *A*, 15.35 feet. This change (which corresponds to 200″) is designed to be excessive.

$$x_A' = 15.35 \text{ ft.}$$

$$x_B' = \frac{10420 \times 15.35}{15870} = 10.10$$

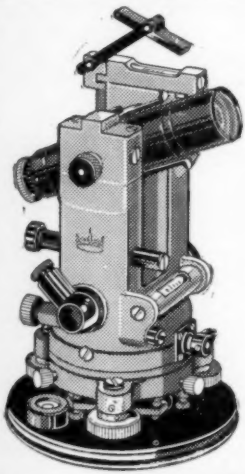
$$x_C' = \frac{18560 \times 15.35}{15870} = 17.97.$$

Draw the second error triangle, its sides parallel to the respective sides of the first, at the above offset distances.

6. Find the unknown point, *I*. Join the corresponding vertices of the first and the second triangles. (The latter is designated in figure 2 by primed lower case letters.) The point of intersection of these three lines (extended if necessary) is the plotted position of the point *I*. Scale its coordinates by reference to those of *AP*.

$$I: \quad x = 39378.2 + 13.0 = 39391.2 \text{ ft.}$$

$$y = 30243.8 - 5.0 = 30238.8 \text{ ft.}$$



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Two new certificates of accomplishment, to be granted to students who complete organized courses of study in surveying and mapping, have been announced by the U. S. Department of Agriculture Graduate School.

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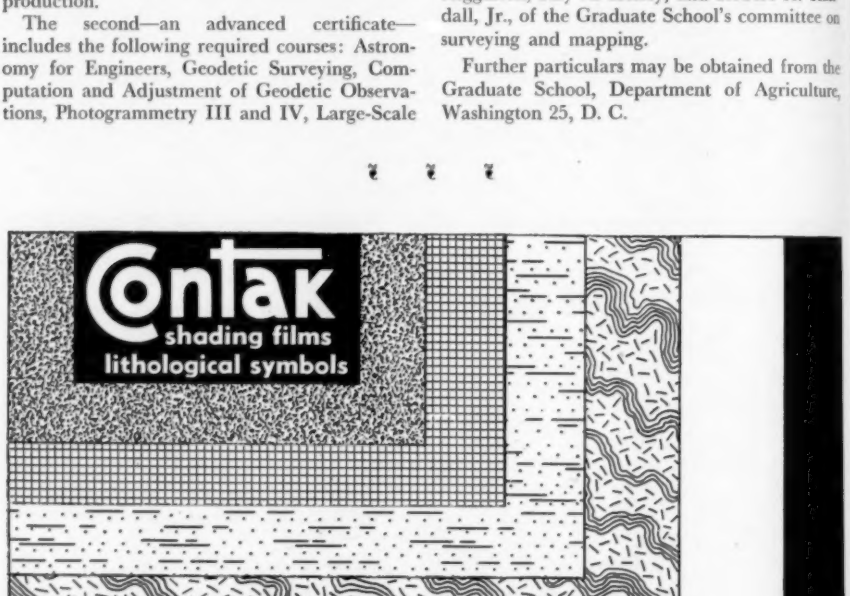
Equivalent courses will be accepted by transcript from other institutions to meet a part of the certificate requirements.

The course of study was developed by W. S. Higginson, Ray A. Kelsey, and Robert H. Randall, Jr., of the Graduate School's committee on surveying and mapping.

Further particulars may be obtained from the Graduate School, Department of Agriculture, Washington 25, D. C.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Boxing the Compass

By RICHARD L. THREET

ASSISTANT PROFESSOR OF GEOLOGY, UNIVERSITY OF NEBRASKA

While doing some historical research on the "Ionia Volcano," a bluff of the Missouri River which formerly smoked and emitted sulphurous fumes due to oxidation of iron pyrite in the Carlile (Cretaceous) shale formation, I happened across a delightfully humorous account of the difficulties of land surveying in pioneer Nebraska. The story is contained in the *History of Dixon County*, by William Huse, published in 1896 by *The Daily News Press* of Norfolk, Nebr. The narrative, reprinted below in the words of Mr. Huse, contains some sense and some nonsense in a combination which may provide several minutes of pleasant diversion.

A Surveying Expedition and the Triumph of Good Luck

NOT LONG after becoming a resident of Nebraska, I had the pleasure of making the acquaintance of the recently elected county surveyor, Mr. Sullenberger. Mr. S. was the genial captain of a sawmill near the river, and his long experience among the machinery of the mill was, to his enthusiastic constituents, a sufficient assurance that he was fully capable of managing and boxing around such a little thing as a surveyor's compass.

Hardly was Mr. Sullenberger's election, as well as his somewhat prolonged celebration of so important an event, safely over, when he enjoyed his first experience as a practical surveyor. A Mr. Martin, who lived about 20 miles or so out on the prairie, near the Cedar County line, wanted to find out the exact center of one of his quarter-sections of land for the purpose of locating at that point a school house. He therefore notified surveyor Sullenberger, who agreed to be on hand the next day and do the work. As this was to be his first effort as a surveyor he invited the writer to accompany him as assistant. He also, with some appearance of nervousness, inquired if I had ever had any experience as a surveyor, and was cheered with the assurance that I had often run lines, though I deemed it unnecessary to state that the only lines I ever ran were clothes lines, which, often on blue Mondays, a combination of circumstances had required to be stretched from pole to pole.

Accordingly, the next morning we made ready for the expedition. Deeming that no surveyors, however well versed, could expect to correctly bombard their way from the circumference to the center of a quarter-section without instruments, we first drove to the house of Mr. Haydon, the former surveyor, to borrow the necessary utensils of him. Mr. H. cheerfully complied with the request. He brought out a brass-bound, shallow, three-legged dish, in which swam like a fish, a long and slender finger resembling the hour hand of a clock. "This," said Mr. Haydon, "is the compass." Then he gave us further instructions—he spoke of verniers, of degrees, of sights, and of water levels, all which were duly appreciated. He said the vernier should be so regulated that the needle (by which we supposed he referred to the aforesaid fish) would point twelve degrees away from where it ought to point. It appeared from his remarks that it is the rule among surveyors to make such a variation on account of the earth having at some time or other flopped its north pole away twelve degrees from the locality to which the head of said fish had been accustomed to point, hence the twelve degrees were to make allowance, as it were, for the perversity of the earth and the stubbornness of the fish aforesaid.

Having thus been duly instructed, we

took the compass, and a chain to measure with, and started on our road to Mr. Martin's place, where we arrived at noon. We were welcomed by Mr. Martin and his family with hospitality; our tired horses were fed and we were furnished a dinner fit for a king. After dinner, Mr. Martin showed us around his farm, pointed out his numerous improvements and his big herd of cattle.

But the time had now arrived when it became necessary to forego further pleasure, and come down to business. Mr. Martin was anxious to have the center of his section of land found and located, and Mr. Sullenberger had come for that purpose; it was therefore high time we were about it, as it was getting late.

As we went to get the compass, Mr. Sullenberger said, strictly in confidence, that his experience as a surveyor was not very extensive and the only feat he ever performed in that branch was when he once assisted to run a line of half a mile, during which he made a variation of about 300 yards. "So small a discrepancy, is, to be sure, hardly worth minding," said Mr. S., "yet probably you had better attend to the compass and I will boss the chain."

It now became my turn to confess in like confidential manner that I was also not heavily burdened by carrying around what I knew about surveying, and that sooner than use the compass, I would attempt to run the lines by walking across the field blindfolded.

So here we were in a fix. Mr. Martin, a little distance off, waited expectantly and confidently. But, though dismayed for a moment at this mutual revelation, we rose in our misfortunes, equal to the occasion. "I will manage the compass," said Mr. S., and with the dignified gravity of an old government surveyor-general, he took it out of the buggy, and mounting it upon its three legs, shouldered it and started for the field of action.

Arriving on the ground, Mr. Martin pointed out the place where he desired us to start from. He wished a line to be run a mile long, when, if correctly done, it would intersect the mound on the other side of the section.

We now proceeded to the task, and this scene is particularly described as it will be instructive to other surveyors. The three-legged instrument, having been duly boxed and shook up so as to make its internal organization work freely, was planted over the desired spot. A thunder storm now appeared and we hastened to make what speed we could in the performance. But there seemed to be many discouragements. The compass wouldn't stay level, and the needle twirled and wiggled around and pointed in all directions except the right one.

"The fluctuations of the needle," said Mr. S., "or, to speak in plainer language, its wabbling and spinning on its pivot like an impaled June bug, are often occasioned by the approach of thunder storms as in this instance, at which times streams of electricity break up through the earth and come ripping and tearing out of the ground, thereby disarranging the motions of all such instruments. Nearness to lava or iron ore also produces the same result. Thus, as you may be aware, I formerly resided at Ionia, and indeed, as you may say, under the shadow of the volcano at that place. Now in that country the slugs of iron and lava which volcanic action has slung out and scattered around, effectually preclude the use of the ordinary compass in the ordinary way. The needle scurries around like a bean in a hot skillet, and the only proper method by which to manage it is to take it out altogether and let it play and kick around awhile on the grass, until it gets the electricity out of it. If you attempt to work it otherwise, you might have to chain it down."

Thus enlivened by scientific discourse, we prepared for the final onslaught. We had been instructed by Mr. Haydon to make an allowance of 12 degrees; on which side however, we had forgotten, but we were greatly assisted in determining, by observing a neighboring corn field, whose rows were said to run north and south. At last, everything being ready, Mr. S. took a long

squint over the compass, and gave a military order for the chainmen and flagmen to shoot out. So out we shot, Mr. Martin as flagman, leading the way with his handkerchief tied to a pole, and the rest of us following with the chain, with which we diligently proceeded to measure off the ground.

It is critical business measuring land, especially if the line runs across ravines, through brush, and over hills. Sometimes one forgets to count the chains, and at other times in the excitement of tumbling into a ditch one may count faster than the law requires.

When we had proceeded forward some distance, the individuals officiating at the two ends compared notes to see how they agreed. They simply varied in their figures, eleven chains, and, in order to settle the difficulty without hard feelings, they split the difference and moved on again. Halfway across, with all these precautions, the spot at the center of the section should be found for the location of the school house. Mr. Martin had previously piled a quantity of brick as near to such center as he could ascertain by pacing. This pile of brick was a great comfort and materially assisted in the labors of the day.

A few rods west of the brick, the central point was announced and a stake driven down. Then Mr. Martin wanted us to continue our journey in the same line so as to hit the mound on the western side, and thereby prove the truth of the survey. This we deemed unnecessary, but still we did it. We concluded that we could not come out five hundred yards away from the mound—at all events we were reasonably confident that we should not get off the section altogether. But for a wonder (occasioned doubtless by a special interposition of Providence) we hit the mound fair and square, and the center of the section was therefore as correctly demonstrated as though a whole congress of surveyors had determined it. "I see," said Mr. S., with scientific severity, "that we have missed the mark by about one inch. Still, in view of the thunderstorm and coming the distance of a mile, perhaps that slight variation may be excusable."

Having thus overcome all the difficulties which beset us, we wended our way back to the house and started for home.

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Aerial Surveys Save Dam Construction Dollars

PUBLIC WORKS officials of Flint, Mich., an industrial center of 175,000 population, have decided that their new water conservation project is a complete success. The dam and reservoir, which accumulates water from the 40-foot-wide, knee-deep Flint River, supplied the city during a year when water shortages were commonplace.

A topographic survey of the broad, shallow valley, in accordance with a 1924 plan for the dam, was started years ago but abandoned when mounting costs indicated that the complete survey would take most of the money then available. A dam was built on a tributary, but rapid expansion of the community during and after the war made it apparent that more water was required. Lake Huron, 65 miles away, was considered, and still is in the ultimate plan, but a less costly, nearby source was chosen for an interim solution. The Flint River dam plan was reexamined and adopted, but again survey costs appeared prohibitive until aerial survey methods were considered. Flint officials say that without the cost-saving aerial mapping of the reservoir area and of the adjacent area upstream, executed by Abrams Aerial Survey Corporation, in 1947, a dam of the needed capacity could not have been built with the money available.

The Flint River dam is an earth-filled structure half a mile long. It floods an area of nearly 2,000 acres, creating a lake ten miles long, a half mile wide, and 28 feet above the original stream at the dam. The storage capacity of 5,760 million gallons, with 650 million gallons available from the old Kearsley Creek reservoir, would supply current needs of the city for nearly a year even if the river were to go dry completely. With normal conditions, there is sufficient water to flush out the river during dry summer periods, to carry away discharge from the city sewage disposal plant.

Control Survey Activities of the U. S. Lake Survey

By W. T. LAIDLY
CHIEF TECHNICAL ASSISTANT, U. S. LAKE SURVEY

THE U. S. Lake Survey was established in 1841 at the city of Buffalo under the Corps of Topographical Engineers, U. S. Army, for the purpose of making a "Hydrographical Survey of the Northern and Northwestern Lakes" in compliance with a Congressional directive earlier that same year. In 1845 the organization was moved to a more central location, at Detroit, where it has since remained. The Lake Survey, organized as a district under the North Central Division, Corps of Engineers, U. S. Army, has two basic responsibilities: (1) the preparation and publication of navigation charts and related material covering the Great Lakes system, Lake Champlain, New York canals, and the Minnesota-Ontario border lakes, and (2) the study of all matters affecting the hydraulics and hydrology of the Great Lakes, including the necessary hydrographic and related surveys, investigations, and observations.

HORIZONTAL CONTROL

In 1841 the only charts of the lakes were the Admiralty charts compiled from surveys of Capt. H. W. Bayfield of the Royal Navy. While a general geodetic survey of the entire chain of lakes was contemplated for the future, the actual operations during the first ten years were confined mainly to surveys of special localities where improvements were called for or where the navigation was difficult. The more extensive surveys consisted of little more than reconnaissance. This course was made necessary because the appropriations were inadequate for the purchase of the finer instruments and for the support of the larger force needed for more exact surveys, and also because of the pressing need for improvements at particular localities. Triangulation was started in 1844, but the principal part of the primary triangulation was observed between 1867 and 1879. Geographic positions and azimuths depended upon astronomic observations until late in the century, when the triangulation of the Coast and Geodetic Survey was extended from the Atlantic Coast to connect with a line of the Lake Survey near Oswego, N. Y., and the transcontinental triangulation of that organization along the 39th parallel was connected with a line of the lake system extending southward from Chicago. The first charts, published in 1852, were in the western end of Lake Erie, and in 1882 the first series of charts was issued covering the Great Lakes. Today there are 142 charts of the area between Lake Champlain and Lake of the Woods.

The Lake Survey has extended the first-order horizontal control from time to time as dictated by charting needs, the last arc being measured in 1919–1921 in Michigan's Upper Peninsula between the St. Mary's River arc on the east and the 1872 work near Munising on the west. Subsequently the Coast and Geodetic Survey has established a series of networks all over the Great Lakes basin, tying into Lake Survey triangulation wherever possible to do so. It will be noted that there is no duplication of effort between these two organizations at the expense of the taxpayer. All existing first-order work of each agency in the Great Lakes area was incorporated into the general adjustment of 1902 and later adjusted into the North American 1927 Datum.

In order to provide control for hydrographic and topographic surveys, a great deal of second- and third-order triangula-

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tion has been established in the Great Lakes basin. Much of this triangulation was referred to early datums, but now work is in progress to adjust it into the primary net on the 1927 datum. A systematic program of station recovery is being pursued in order to preserve the system of control and to keep station descriptions up to date for current public and internal use. It may be seen from the foregoing that no new triangulation is established except for control of hydrography or special projects. A job of particular interest at this time was accomplished late in 1954 in connection with the St. Lawrence Seaway project. The river divides into three channels in the International Rapids section near Massena, N. Y., at the site of the power development and the principal navigation locks in which the United States is concerned. The existing system of horizontal control established in 1872 and 1912 by the Lake Survey and the International Waterways Commission was quite logically established along the most northerly branch, through which all navigation moves, both in open water and in the adjacent Canadian Canal. However, the proposed Long Sault Canal in the present Seaway plans takes a direct route along the south side of the river, making necessary the establishment of new horizontal control. The Lake Survey observed a network of quadrilaterals about 11 miles long over the route of the proposed canal, tying in each end to sides in the basic primary triangulation. Due to the topography and partial tree coverage, observing towers 64 feet high were necessary. Modern methods and equipment were used, assuring satisfactory final results.

VERTICAL CONTROL

The extension of vertical control into the Great Lakes region also presents an interesting picture. Before 1875 the elevations of the Great Lakes with respect to each other and to sea level were known only approximately, being based upon a few railway and canal levels. All lake elevations were refererd to the "High Water of 1838," which was the highest stage of record.

The origin of all Lake Survey levels has been the Gristmill benchmark at Rensselaer, N. Y., for which the elevation above mean tide at New York City has been determined at various times by the Coast and Geodetic Survey. In 1875 and 1876 the Lake Survey ran precise levels from Rensselaer to Oswego by way of the Mohawk and Oswego River valleys, and extended the values throughout the lake system by means of water-level transfers and precise level lines between the lakes. Benchmarks were established in the important harbors by water-level comparisons. All of this work constitutes the "Levels of 1877," which were used by the Lake Survey until 1903. There were many discrepancies and the results were poor when judged by modern standards, but they were much better than anything existing up to that time.

Realizing the need for better elevations, the Lake Survey engaged in considerable leveling activity in the years 1898–1902. In collaboration with the Deep Waterways Commission, new connections were made between Rensselaer and Oswego by way of the Mohawk River and also by way of Lake Champlain and the St. Lawrence River. Lines were rerun between all the lakes along their connecting rivers. The 1898–1902 work was used by the Coast and Geodetic Survey in their 1903 adjustment of all levels east of the Mississippi, and this adjustment forms the basis for present day elevations.

In fulfillment of its mission relating to water levels, the Lake Survey maintains about 40 gages at strategic points on the Great Lakes and their outflow rivers. Reliable records are available dating back to 1815 on Lake Ontario, 1819 on Lake Erie, and 1836 on Lake Michigan, but until 1860 these records are scattered and fragmentary.

A very startling natural phenomenon affecting lake levels and vertical control is the crustal movement or earth tilt in the lakes basin. The layman is apt to consider the earth a fairly stable foundation and the surveyor is not too concerned if a benchmark settles or rises, but the rise or subsidence of great land areas is another story. It has been clearly demonstrated that such

movement is taking place at varying rates all through the lakes region and extending to the eastern seaboard. The amount of relative movement on a lake can be determined between any points where gage readings are available over a long period, and the rate of movement with respect to sea level can be determined by comparison of successive precise level lines. The pattern in the lakes basin is fairly uniform with but few anomalies. Nearly all of the basin is subsiding with respect to sea level.

Crustal movement such as this must be analyzed and taken into account when establishing benchmark elevations to control harbor improvements and lake levels. Therefore, the 1935 Datum, now in use by the Lake Survey, was established. This was not a level adjustment. The 1935 Datum accepted the 1903 Adjustment values at a single control point on each lake and brought the elevations of all other points on the lake in harmony with the control point in that year. Subsequently, as the crustal movement on a particular lake approaches 0.1 foot in magnitude, elevations of benchmarks in all harbors are changed to harmonize with those of the control point, where zero movement is assumed.

Because of the importance of vertical control to offices of the Corps of Engineers in channel and harbor dredging, the Lake Survey recovers and relevels to benchmarks at each lake harbor every three years. Benchmarks not immediately adjacent to improvement projects are recovered only as the need arises. Long term experiments are being conducted in two widely separated test areas to evaluate the stability of several types of marks.

Two years ago when the building of the St. Lawrence project was assured, it was realized that Canada and the United States must agree on basic hydraulic, hydrologic, and vertical control data in order that cooperative effort could be directed toward design and operation of the many features of the project. An international coordinating committee conceived by the Lake Survey is now functioning and making important progress. Before the end of 1955, new precise levels will have been accomplished by both countries all the way from sea level in the Gulf of St. Lawrence to Lake Ontario and between the several lakes. As a result of this work, a Great Lakes Datum of 1955 will be established, thus marking another milestone in the history of vertical control in the lakes basin.

Plane Coordinate Projection Tables

STATE plane coordinate projection tables for the States of Montana, Pennsylvania, California, Louisiana, Connecticut, and Maryland (Special Publication Nos. 325, 326, 327, 329, 330, and 331, respectively) were recently issued by the Coast and Geodetic Survey. The publications are part of a series which will ultimately include all States. Tables have been issued previously for Florida, Minnesota, Nebraska, North Carolina, North Dakota, South Dakota, Utah, Wisconsin, and Wyoming. Tables for other States will be produced as part of a long-range program, with completion depending upon available personnel and funds.

The tables in each publication contain plane coordinates for 2½-minute intersections of meridians and parallels within the limits of the State, based on the State plane coordinate system established by the Coast and Geodetic Survey. The tables are arranged by 12½-minute bands of latitude with the full range of longitude of the zone followed by the coordinates for the next higher band of latitude. The tables are also arranged by zone.

Copies of these pamphlets may be obtained from the Superintendent of Documents, Washington, D. C., at the following prices: No. 325, $1.50; No. 326, 45 cents; No. 327, $1.75; No. 329, 50 cents; No. 330, 20 cents; and No. 331, 25 cents.

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General Interest

ETUDE SUR LE STATUT DU GEOMETRE DU REGISTRE FONCIER SUISSE. Paul Terlink. *Le Geometre-Expert & Geometre-Architecte Independant,* (Belgium), No. 49, September–October 1954. (This is chapter 29 of the "Etude sur le Statut du Geometre Dans les Differents Pays" being published serially in this periodical.)

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ON OBSERVATIONS AND ADJUSTMENT. B. Goussinsky, *Empire Survey Review*, Vol. 13, No. 95, January 1955. (General discussion.)

THE ADJUSTMENT OF A BLOCK OF AERIAL TRIANGULATION EVALUATED WITH THE WILD A5. H. H. Brazier. *Empire Survey Review*, Vol. 13, No. 95, January 1955. (Discussion of a method of adjusting plots for errors in azimuth, scale, and elevation.)

ADJUSTMENT OF A LEVEL NET BY SUCCESSIVE APPROXIMATIONS AND BY ELECTRICAL ANALOGY. Hsuan-Loh Su. *Empire Survey Review*, Vol. 13, No. 95, January 1955. (Mathematical summary of adjustment method.)

TRIANGULATION ADJUSTMENT BY ORTHOGONALIZATION. Dr. B. Cvetkov and J. E. Lilly. *The Canadian Surveyor*, Vol. 2, No. 6, January 1955. (Mathematical exposition.)

PHILOSOPHY OF COMPUTATION, ITS APPLICATION TO THE FIELD OF GEODESY. H. H. Brazier, *The Canadian Surveyor*, Vol. 12, No. 6, January 1955. (Discussion of the important role of the computer in the final results of a geodetic survey.)

FLARE TRIANGULATION. Maj. L. M. Sebert. *The Canadian Surveyor*, Vol. 12, No. 6, January 1955. (Description of a survey based on flare triangulation carried out in Manitoba and an appraisal of its accuracy.)

NEW ERA OF GEODESY. W. A. Heiskanen. *Science*, Vol. 121, No. 3133, 14 January 1955. (Discussion of new methods and instruments employed in modern geodetic measurement.)

SPEED OF LIGHT USED IN SURVEYING. (News item.) *Engineering News-Record*, Vol. 154, No. 4, January 27, 1955. (Description of the operation of a geodimeter.)

IS ARMCHAIR TRIANGULATION HERE? Thomas E. Riley. *Engineering News-Record*, Vol. 154, No. 12, March 24, 1955. (Describes method of flare triangulation, developed in Switzerland and field-tested by the Army Map Service and Canadian Government, using short-wave radio and automatic recording cameras.)

Education

HOW YOU CAN COMPETE FOR TOP-TALENT GRADUATING ENGINEERS. John F. Lee. *North Carolina Engineer*, Vol. 11, No. 2, January 1955. (Although the author is a professor of mechanical engineering, his observations are applicable to the profession generally.)

MORE TRAINING FOR YOUNG ENGINEERS. Harry A. Williams. *Civil Engineering*, Vol. 25, No. 1, January 1955. (Plea for greater opportunities for graduate study in engineering.)

IS ENGINEERING BEING TAUGHT BACKWARD? John B. Wilbur. *Civil Engineering*, Vol. 25, No. 1, January 1955. (Suggests teaching the total concepts of the art of engineering before the more detailed scientific aspects of the technology.)

EMPLOYERS, ETHICS, AND YOUNG ENGINEERS. Clement J. Freund. *Civil Engineering*, Vol. 25, No. 1, January 1955. (A brief for impressing engineering students with their code of ethics with a comparison between the lot of the hospital interne and the beginning engineer.)

CHANGING ENGINEERING EDUCATION—DO WE UNDERSTAND WHAT HAS HAPPENED? W. S. Evans. *Civil Engineering*, Vol. 25, No. 3, March 1955. (The author does not feel that the deemphasis on field work and practical exercises will be a handicap if employers recognize the application of theory acquired by engineering graduates and give them the opportunity for the development of the techniques.)

Instruments

THE WATTS MICROPTIC THEODOLITE No. 2. Hilger and Watts, Ltd., *Bulletin Geodesique*, No. 34, December 1954. (Detailed description of instrument.)

SURVEYING EQUIPMENT RESEARCH. Col. Melvin C. Shetler. *The Military Engineer*, Vol. 47, No. 316, March–April 1955. (Discusses developments in various kinds of instruments, electronic devices, etc., employed by the Corps of Engineers.)

Property Surveys

NEW RIGHT-OF-WAY GROUP FORMED. (News item.) *California Highways and Public Works*, Vol. 33, Nos. 11–12, November–December 1954. (San Diego club becomes affiliated with the American Right-of-Way Association, an organization of professional right-of-way engineers.)

SAN MATEO AND DUMBARTON BRIDGE APPROACH PROBLEM. R. H. Barnwell. *California Highways and Public Works*, Vol. 33, Nos. 11–12, November–December 1954. (Practical examples of land acquisition survey and title problems.)

AIDS TO THE DOMESDAY GEOGRAPHY OF NORTHWEST HEREFORD. Lord Ren-

nell of Rodd. *The Geographical Journal,* (The Royal Geographical Society, London), Vol. 120, Part 4, December 1954. (A discussion of interest to students of the early history of land surveying.)

THE TRIANGULATION OF CULTIVATION OVERLOOKED BY HIGH GROUND. J. W. Wright. *Empire Survey Review,* Vol. 13, No. 95, January 1955. (First of a two-part article dealing with a survey problem in the vicinity of the Nile River in Egypt.)

Topography

USE AND CONSTRUCTION OF AERIAL PHOTO BASE MAPS. Robert G. Pruitt. *Georgia Mineral Newsletter,* Vol. 7, No. 4, Winter, 1954.

ASSEMBLY OF MULTIPLEX PLOTS. S. G. Gamble and W. D. MacDonald. *The Canadian Surveyor,* Vol. 12, No. 6, January 1955. (Describes method used in Canadian Topographical Survey.)

BOOKS AND PAMPHLETS

MAPPING FUNCTIONS OF THE CORPS OF ENGINEERS. U. S. Department of the Army. Washington, *GPO,* 1952, 149 pp. (TM 5-231.)

AN INTRODUCTION TO THE STUDY OF MAP PROJECTIONS. J. A. Steers. Ninth Edition, London. *University of London Press,* 1953. 320 pp., maps. (New foreword by F. Debenham.)

MULTIPLEX MAPPING. U. S. Department of the Army. Technical Manual 5-244. Washington, D. C., 1954. 176 pp.

SURVEY OF INDIA, GENERAL REPORT 1951. Published by order of Brigadier I. H. R. Wilson, Surveyor General of India. Printed at the Office of the Geodetic and Training Circle, Survey of India, Dehra Dun, 1954.

MAP INTELLIGENCE. U. S. Army Map Service. AMS Training Aid No. 6. 2nd Edition, 1954. Washington, D. C., 1954. 320 pp.

TRAITE DE GEODESIE. Pierre Tardi and Georges Laclavere. *Gauthier-Villars,* 55 Quai des Grands Augustins, Paris 6, France. In three volumes. Volume I, Triangulations, Fascicule 1: Les fondments mathematiques de la Geodesie. Operations sur le terrain. ix and 387 pp., 120 figures, 1951, $7.49. Volume I, Fascicule 2: Le calcul de la Triangulation. x and 325 pp., 76 figures, 1954, $10.91. Volume II, Astronomie geodesique (in press). Volume III, Champ de potentiel terrestre. La figure de la terre (in preparation).

THE GEODIMETER MEASUREMENT OF THE RIDGEWAY AND CAITHNESS BASES, 1953. Maj. I. C. C. Mackenzie. Ordnance Survey Professional Papers, New Series, No. 19. *Her Majesty's Stationery Office,* London, 1954. iii and 46 pp. (Account of a test made at the request of the U. S. Army Map Service using instrument over bases previously measured by invar tape.)

THE LAW AND PRACTICE OF DEEDS REGISTRATION. D. Newall. *Butterworth & Co. Ltd.* (Africa), Durban, 1954. xxxi and 528 pp. (Historical and general.)

HAIL COLUMBIA, THE THIRTY-YEAR STRUGGLE FOR GRAND COULEE DAM. George Sundborg. New York, *The MacMillan Co.,* 1954. xvii and 467 pp. (An inspiring history of one of the greatest engineering projects of all time.)

PHOTOGRAPHIC MEASUREMENTS, PROBLEMS AND SOLUTIONS. Gomer T. McNeil. New York, *Pitman Publishing Corp.,* 1954. 244 pp. (Reviewed in Jan.-Mar. 1955 issue of SURVEYING AND MAPPING.)

THE NAUTICAL CHART OF 1424 AND THE EARLY DISCOVERY AND CARTOGRAPHICAL PRESENTATION OF AMERICA. A. Cortesao. *University of Coimbra,* 1954. xix and 123 pp.; illus. Reviewed in *The Geographical Journal,* Vol. 120, part 4, December 1954.)

—LYMAN D. LYNN

DISTINCTIVE RECENT MAPS

Plastic relief maps in three dimensions have served the military and defense agencies of the country since World War II. During the past several years, relief models of molded plastic have been prepared by several commercial producers for sale to schools and the general public. Panoramic Studios, 6122 N. 21st Street, Philadelphia 38, Pa., has recently placed on the market a series of seven *Earth Curved Relief Maps.* Each map, or plaque, 23 inches in diameter, is shaped to the true curvature of the earth and shows major relief features in third dimension. Oceans and other water features are in blue, and land areas in various tones of brown. The maps pres-

ently available are centered on North America, South America, Europe, Asia, Africa, Australia, and the North Pole. The price is $9.95 each. Weighing only 14 ounces, these "continental plaques are being used for decoration and for education in homes, schools, and offices."

A World Map of Religions was copyrighted in 1955 by Weber-Costello Co. of Chicago, for Broadman Supplies, Nashville 3, Tenn. Designed for wall display, the map measures approximately 33 by 40 inches and is printed on rubberized non-tear plastic. Eight major religious groups are identified by contrasting colors. The map is on the Mercator projection, centered on the American continent. The equatorial scale is 1:41,817,600.

Nördliche Erdhälfte is a large hypsometric relief map of the northern hemisphere, centered on the North Pole. It was compiled under the editorship of Prof. Carl Troll, for Flemmings Verlag, Hamburg, and printed by Lindemann & Lüdecke, West Berlin. It is at the scale of 1:12,500,000 and is printed on four sheets, each measuring 39 by 33 inches.

The Arctic and Antarctic regions are shown on a colorful shaded-relief map published in 1954 by Karl Wenschow of Munich, Germany. Titled *Nord-Und Süd Polargebiete,* the map is in two sheets, each of which can be mounted separately or joined as one large wall map measuring approximately 50 by 66 inches. The scale of both maps is 1:10,000,000.

Ocean depths, ice sheets, routes of explorers, and limits of icebergs are shown, in addition to land relief.

Canada Régions Polaires et Extreme-Nord Soviétique, presents the north polar regions on the polar equidistant projection. Included among the various types of information it shows are limits of the pack ice, continental glaciers, 10-degree (C.) July isotherm, forest areas, extent of various crop regions, mineral deposits, and transportation and communication lines. The map is no. 64 in the series prepared by the Direction de la Documentation, [France] Ministere des Finances et des Affairs Économiques, and published [1954] by l'Institut Geographique National [Paris]. The scale is 1:12,000,000 and the dimensions are 32 by 25½ inches.

Richard M. Page copyrighted, in 1955, a series of four maps of the United States picturing generalized climatic conditions. *U. S. All-Year Climates,* based upon temperature and humidity, rates the various parts of the country according to seven types of climate, ranging from "ideal" (comfortable winters, comfortable summers) to "double loser" (summers too hot, winters too cold). The summer map recognizes five climate zones (cool, ideal, hot, distressing, and suffocating), while for winter the corresponding regions are rated as "arctic," "frigid," "cold," "cool," and "ideal." The fourth map shows *Winter and Summer Wind Velocities.* The maps measure 17½ by 23½ inches. No scale is given.

A number of new marketing maps of the United States have been published in recent months. Schenley Distillers Co. copyrighted in January 1955 a *Thermal Map of the United States for Summer Promotion Planning.* Based on U. S. Weather Bureau records of 20-year average daily maxima, this black-and-white map indicates when different parts of the country reach temperatures of 70 degrees (F.) or above. The map measures 10½ by 15 inches. No scale is given.

The Marketing Division of The American Weekly (Hearst Publishing Co., Inc.) copyrighted in 1954 *The Supermarket County Map of the United States.* It was compiled to help "appraise each U. S. county as a source of supermarket sales and establish sales and distribution controls." Each county is keyed according to the number of supermarkets it contains. The map is published in two sizes, 23 by 34 inches, and 34 by 41 inches. The scale of the latter is approximately 1:5,000,000.

A series of maps outlining distributor areas for various electrical appliances was prepared by the Marketing and Plans Department of This Week Magazine, and copyrighted in January 1955 by United Newspapers Magazine Corp. Among the products included in the study are electric bedcoverings, window fans, hassock fans, desk and pedestal fans, electric housewares, vacuum cleaners, automatic washers, ironers, electric dryers, and air conditioners. All the maps are printed in color on sheets measuring 30 by 40 inches. Graphs and lists of the newspapers which distribute This Week Magazine are printed in the map margins.

The prospecting for underground natural resources is stimulating the publication of special maps. A recent example is the *Geologic Map of New Mexico Showing Uranium and Petroleum Prospects,* published in January 1955 by The Oil News and Uranium Digest, P. O. Box 526, Albuquerque, N. Mex. This black-and-white map shows areas of sedimentary and igneous rocks, oil and gas fields, petroleum-producing zones, active uranium mines, prospects, and regions where "anomalous radioactivity has been observed from the air." The scale is 1:1,000,000 and the size approximately 27 by 24 inches. A larger-sized edition, in two sections, with an overall measurement of 48 by 54 inches, is also for sale by the publisher.

A new *Geologic Map of Oklahoma* was prepared and published cooperatively in 1954 by

the Oklahoma Geological Survey and the U. S. Geological Survey. Prepared under the direction of Hugh D. Miser, the map is the product of seven years' labor and the generous cooperation of oil companies, independent geologists, institutions, and others interested in the geology of the State.

The map, at the scale of 1:500,000, shows, by distinctive color patterns, the areal distribution and extent of more than 125 different rock units ranging from ancient granites of pre-Cambrian Age to alluvial deposits of sand and gravel along streams. The oil-bearing formations and major dislocations in the earth's crust are also shown. Measurements of the map are 40 by 72 inches. Copies can be purchased (with or without road overprint) from the Oklahoma Geological Survey (Norman), or the U. S. Geological Survey, (Denver, Colo., *or* Washington, D. C.). The price is $2.50.

Mapa del Peru, published in 1953 by the Instituto Geografico Militar, gives an up-to-date cartographical picture of Peru. It shows international boundaries, departmental boundaries and capitals, other important cities and towns, streams and rivers, railroads, secondary roads, and the Pan American Highway route through Peru and portions of neighboring countries. The map is at the scale of 1:3,000,000 and measures 30 by 21 inches.

Several interesting and colorful maps, designed to lure and guide tourists, have recently been published by the Ministère des Travaux Publics des Transports et du Tourisme, Direction Générale du Tourisme, Paris, France. *French Chateaux* locates "specimens of all sorts of chateaux in different regions of France." They are classified by symbols in four groups: (*a*) Medieval Ruins and Monuments, (*b*) Renaissance Buildings, (*c*) XVIIth Century Edifices, and (*d*) XVIIth Century Monuments. On the verso of the map sheet, which is designed to fold and fit the pocket, are a list of "Some of the Great French Chateaux, keyed to locations on the map; illustrations of several chateaux; and enlarged insets of the Loire and Ile-de-France regions." The map measures 24 by 24 inches and is at the scale of 1:1,400,000.

Journeys in Protestant France "maps out journeys which will lead [members of the Protestant faith] into a world they know well and where they can feel at home. In Paris, La Rochelle, Pau, Sedan, Alsace, Montbeliard, in the Cevennes valleys, or at the foot of the Tower of Constance, they will find themselves in surroundings which evoke memories of childhood days." Brief descriptions of such tours are printed on the right and left margins of the map sheet and on the verso. The map measures 12½ by 12½ inches and has a scale of 1:3,250,000.

Sanctuaries and Pilgrimages is designed to attract tourists of the Catholic faith. The map provides "a choice of several itineraries for those who wish to visit those places of religious interest in France whose names are familiar throughout the Catholic world and perhaps to take part in some of the more important religious events." The scale and size are the same as for *Journeys in Protestant France.*

Ten Brink's Kantoorkaart Van Nederland, at the scale of 1:400,000, is a clear and detailed map of the Netherlands. It was printed by Mouton and Co. of The Hague. More than 2,500 places are shown on the map and keyed to an alphabetical index printed at the bottom of the sheet. Provinces are outlined and distinguished by contrasting colors. Brown shading shows very generalized relief. Several classes of roads and railroads are shown, with distances marked between highway junctions.

Die Elbe von Wittenberge bis zur See shows this important European water artery and its tributary hinterland in clear detail at the scale of 1:50,000. Printed on six sheets, the map was compiled by Wasser- und Schiffahrts-direktion Hamburg (Germany), and printed by Landesvermessungsamt Schleswig-Holstein (1950–1952). Each sheet measures 24½ by 36½ inches.

D. Gribaudi is the compiler of an interesting agricultural map of Italy (Carta delle Regioni Agrarie d'Italia), published recently by Shell Italiana Societa per Azioni, and printed by Istituto Geografico de Agostini, Novara, Italy. The country is classified as to "mountains," "hills," and "plains." An accompanying table gives percentage of land in each of these categories, by provinces. The scale of the map is 1:1,250,000 and the size, 38 by 31 inches.

The Free Territory of Trieste (Territorio Libero di Trieste) is delimited on a new map published by Istituto Geografico Visceglia, Via Viminale, 8, Rome, Italy. At the scale of 1:100,000, the map includes many small towns and villages within the Free Territory as well as the immediately adjacent areas. The boundary between Zone A (Italian Administration) and Zone B (Jugoslav Administration) is boldly marked. Areas, in hectares, are given on the inside of the cover folder for communes in both zones. The map measures 26 by 17½ inches.

Maroc Voies de Communication 195. features the transportation network of French North Africa. It was compiled, designed, and published by Institut Geographique National, Annexe du Maroc. The map shows six classes of roads or trails, distances between important junctions, standard and narrow gauge rail lines, and several categories of populated places. The map is at

the scale of 1:1,500,000 and measures 23 by 29 inches.

Main Agricultural Regions of the Anglo-Egyptian Sudan are outlined on a map recently issued by the Sudan Survey Department, Khartoum. It is at the scale of 1:8,000,000 and measures 16 by 10 inches. In addition to eleven categories of agricultural (or non-productive) lands, the map shows provincial and international boundaries, railways, telegraph lines, two classes of roads, and aerodromes.

A rather extensive network of highways is presented on *The Anglo-Egyptian Roads* map published in 1954 by the Sudan Survey Department, Khartoum. Roads are classified as "all weather," "all season," and "dry season." The map also shows international and provincial boundaries, and railways and telegraph lines. The scale is 1:4,000,000 and the size approximately 27 by 20 inches.

The petroleum-rich Sheikdom of Bahrain, in the Persian Gulf, is portrayed, at the scale of 1:63,360, on a map published in 1954. It was compiled from recent air photos by Hunting Aerosurveys, Ltd., 29 Old Bond St., London, W. 1. Control was supplied by the Bahrain Petroleum Co., Ltd. The map, which measures 37 by 26 inches, shows relief by contour lines drawn at 20-foot intervals. Roads (two classes), tracks, wadis, date gardens, cultivated areas, marshes, water wells and springs, and "prehistoric tumuli" are among the other mapped features. There are enlarged insets of the cities of Manama, Muharraq, and Awali.

—Walter W. Ristow
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Books in Review

SIMPLIFIED SITE ENGINEERING FOR ARCHITECTS AND BUILDERS. Harry Parker and John W. MacGuire. *John Wiley & Sons,* New York, 1954. 250 pp. $5.00.

This book appears to be the latest one of a series of "simplified" treatments of problems arising in the building industry. It is obviously designed to bridge the gap between tasks which should be handled directly by even a small architectural organization and those so extensive or complicated as to dictate the employment of a registered engineer or surveyor.

In the opinion of this reviewer, the title might have more clearly indicated the contents of the book if the words "condensed" or "abbreviated" had been substituted for "simplified." Often the attempt to cover an extensive subject within the limits of a relatively small book does not result in a product which is more easily understood.

There is little or nothing in the book under consideration which is not to be found in many existing texts on algebra, trigonometry, and plane surveying. However, the selection of material to be included has been carefully made and results in a compact volume which should be of considerable use as a text for a short course in surveying for students of architecture or as a reference book for the practicing surveyor who is concerned only now and then with surveys of building sites and the attendant problems of surface drainage, driveways, earthwork quantities, and lay-out surveys.

The text portion of this book runs 194 pages, the balance of the 250 pages being filled with the usual 5-place tables of logarithms of numbers and 5-place, 1-minute tables of the logarithms of sines, cosines, tangents, and cotangents. Other necessary but smaller tables are scattered through the text. Many numerical examples, completely worked out, increase the value of the book for anyone using it as a text for home study or as a refresher text.

HOWARD S. RAPPLEYE
Coast and Geodetic Survey (Retired)

BOUNDARY CONTROL FOR SURVEYORS IN CALIFORNIA. Written by Curtis Maitland Brown, Licensed Land Surveyor and Instructor at San Diego Vocational School and Junior College. Sponsored by the San Diego Council of Registered Engineers and Licensed Land Surveyors. Lithographed by *Frye & Smith, Ltd.,* San Diego, Calif., 1954. 150 pages. $2.00.

This book, although written from the viewpoint of California law, contains much useful everyday information of value to all surveyors. It is very readable, written very much to the point, and has been well illustrated.

The contents include a chapter on general legal principles which defines the terms commonly used in survey work and also emphasizes the order of importance of the elements involved in a good deed. A chapter on resurveys of subdivisions explains in some detail, and with appropriate illustrations, the techniques to be applied in reestablishing property boundaries. A similar treatise details the problems which face the surveyor in metes and bounds surveys. Other sections of the book cover such subjects as vacations, reversions, riparian owners, adverse rights, and the expert witness.

For some years the Property Surveys Division of ACSM has been interested in developing a handbook for the practicing land surveyor. This publication meets many of the objectives set forth by the Division and might well serve as a model for similar publications in other States.

F. C. MIRGAIN
North Dakota Agricultural College

(EDITOR'S NOTE.—Mr. Brown's book has precipitated much discussion, pro and con. We present below extracts from three letters received by Secretary Dix concerning the book.)

W. C. WATTLES*—Mr. Brown's book is a good brief abstract of the statutes and case citations of California, and provides a fair reference work for such matters, including the Subdivision Law and the Licensed Surveyors Act. There are numerous comments, problem diagrams, and statement explanations, which in the main are correct basic procedure.

My criticism is concerned, principally, with the academic style of recital. The "rules" laid down are basic and generally usable, but are too rigid for the subject matter. There are practically no rules which are 100 percent applicable without some qualification. This ap-

* Vice President, ACSM, Glendale, Calif.

plies to the statutes and citations also; every problem requires interpretation of rules in multiple, the "majority probability" attitude; this phase is lacking in the book.

Except for collateral reference, and comparison use of comments made therein on certain procedures, the book does not appear designed to be of too great weight outside California. As a matter of fact, the text itself is specifically California.

As to chapter one, and the introduction, the above statements as to inflexibility are pertinent. The definitions are in several cases insufficient; they imply certain conditions which are not always correct. He who reads must scan between the lines for possible proper interpretation.

General California review will very probably be favorable, and rightly so up to a point, but acceptance without question or analysis will cause difficulties.

The book will be valuable in the hands of those who have the training and experience to evaluate it, but dangerous to those of lesser capacity; blind acceptance leads to pitfalls.

I have talked with others here about this book and have had similar reaction. One comment (and accepted by the author) is to the effect that there should have been more interspersing of the phrase "but the contrary may be shown."

The book is a necessary project but I feel a revision and modification should be had before ACSM can give it 100 percent support. I haven't had opportunity to discuss the book fully with Mr. Brown, but the short time I spent with him leads me to believe he would be glad to cooperate in smoothing out rough spots.

S. A. Bauer†—My impression of the book was very much in line with the opinion of our good friend, Bill Wattles. It is a noble effort to get out such a book, as my experience with the Handbook proves, but I am inclined to agree that in the over-simplification and in the positiveness with which Mr. Brown expounds his views, the book could easily become a damaging rather than a helpful document. I feel that experienced men who know that such matters must be carefully weighed and judged will not need the book particularly, whereas the inexperienced will get the completely erroneous idea that the rules are as inflexible and rigid as Mr. Brown makes them out to be. The difficulty and charm of our very trying profession lies in the fact that no rule is absolute and there is no substitute for intensive study, investigation, and sound judgment. I think the Congress should be very careful not to promote the idea of over-simplification of a complex legal and engineering composite job.

There has been, since the war, a considerable trend in professions toward watering down in order to facilitate work. With all this talk of a "shortage of engineers" there is a growing tendency toward this watering-down process. It can only serve to debase the profession and damage the public welfare. On the other hand, efforts such as the one Mr. Brown has made should not be discouraged, but I do think that all efforts should be made to have such documents present a truer picture of the situation than the one presented.

C. R. Herr‡—So far, most, if not all, comments in regard to the book have been quite favorable. At a meeting of the executive committee of the Southern California Section of ACSM, I asked several members what their reactions were with regard to the book, and they were all of the opinion that it was quite a good and worthwhile treatise.

The book is short, but gives many references to be studied further by those in need of a particular point in question. I feel quite certain that, if every practicing surveyor in California would take time to study this book and then follow the rules and regulations as outlined, there would be a better job of surveying done by the profession as a whole.

I have ordered twelve copies for Pasadena City College to use in my class in plane surveying and hope that the boys can get a better idea of what boundary surveying means.

† Past President, ACSM, Cleveland, Ohio.

‡ 1954 Chairman, Southern California Section, ACSM, Pasadena, Calif.

THE BOUNDARIES OF CANADA, ITS PROVINCES AND TERRITORIES. Norman L. Nicholson, Geographical Branch, Department of Mines and Technical Surveys, Ottawa, Canada. 1954. 142 pages. $0.75.

This book presents an informative and scholarly study of the major boundaries of Canada. It analyzes their present geographical location, shows the stages through which they developed, points out their relationship to geographical

regionalism, and touches on how present and future boundary problems may be handled.

The first three chapters introduce the subject and deal with the early development of the major political boundaries. The next four chapters take up recent development of the national, international, provincial, and territorial boundaries; and the last three treat the critical subjects of demarcation and administration, boundary adjustment and adjustment to boundaries, and conclusions based on the study.

The relation between the evolution of the boundaries and geography is emphasized. Although the study is comprehensive in its scope, not every boundary could be dealt with in complete detail. Consequently, certain boundary controversies, representing varying circumstances, were selected for rather exhaustive study to show how their problems were treated. Among these were the Canada-Newfoundland boundary, as an example of an international problem; the Ontario-Manitoba boundary, as an example of an interprovincial problem; and the Alberta-Saskatchewan boundary, as one of several examples of modern boundary establishment in recently developed areas.

The divergence between political boundaries and boundaries of geographic regions in many instances is pointed out. The difficulty of changing established political boundaries is recognized, and the practice of making adjustments to such existing political boundaries is treated, as well as the possibility of applying sound geographical principles to the establishment of new boundaries within the Territories of today. In this way, the book functions not only as an excellent treatment of the present boundaries of Canada, but also as a guide to new boundary making.

The book is adequately and clearly illustrated. In addition to five plates in the appendix, representing photographs of various boundary markers and related matters, 24 figures are scattered throughout the book showing major voyages of discovery, boundary evolution, geographical regions, classification of boundaries, and other boundary situations. Of particular interest is the map depicting the classification of the major internal boundaries of the country. The fact that few of the boundaries are of the same type throughout their length is clearly illustrated. The approximate length of each boundary is listed in the appendix, as well as the total length of both land and water boundaries for each major political unit.

This book is an excellent piece of work, applying modern geographic knowledge to the study of boundaries. It reflects careful and thorough research and an adequate amount of field work. It is logically organized and well written, and is worthwhile reading for anyone even remotely interested in boundaries.

A. J. WRAIGHT
U. S. Coast and Geodetic Survey

Committee on a National Atlas of the United States

The Earth Sciences Division of the Research Council of the National Academy of Sciences, of which ACSM is a member, announced as of December 17, 1954, the establishment of the Committee on a National Atlas with the following membership:

Carleton P. Barnes, U. S. Agricultural Research Service, *Chairman*
Col. J. D. Abell, Army Map Service
James R. Anderson, U. S. Agricultural Research Service
Clarence E. Batchelet, U. S. Bureau of the Census
Anthony P. Dean, U. S. Forest Service
Herman R. Friis, U. S. Archives
Arch C. Gerlach, Library of Congress
Charles B. Hitchcock, American Geographical Society
Arnold C. Orvedal, U. S. Soil Conservation Service
Col. Richard Philbrick, U. S. Air Force Aeronautical Chart and Information Service
Louis O. Quam, Office of Naval Research
John C. Reed, U. S. Geological Survey
Herbert C. Thom, U. S. Weather Bureau

The Committee has been organized to investigate the ways and means of producing a national atlas similar to those of France and the forthcoming one of Canada. Previous committees of the Association of American Geographers and the American Geographical Society, which have already investigated this problem, concluded that a loose-leaf atlas presents the only feasible type at this time.

—WALTER S. DIX
Secretary, ACSM

MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.

—EDITOR

U. S. Geological Survey Topographic Maps

THE FOLLOWING quadrangle maps were published by the U. S. Geological Survey between December 1, 1954, and February 28, 1955. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter P which are planimetric); water features (in blue); works of man, including cities, towns, scattered habitations, schools, churches, railroads, roads, boundaries, and place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinate systems are indicated in the margins of the maps. An information folder further describing topographic maps and symbols is available on request.

Standard quadrangle maps may be obtained for 20 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colo., for maps of areas west of the Mississippi River).

Alabama

BRIDGEHEAD[1]—Baldwin
DAPHNE[1]—Baldwin
HURRICANE[1]—Baldwin
KUSHLA[1]—Mobile
SPRING HILL[1]—Mobile

Alaska

BLYING SOUND (C-8)*—Third Judicial Division
BLYING SOUND (D-8)*—Third Judicial Division
CORDOVA (C-5)*—Third Judicial Division
HAGEMEISTER ISLAND (C-1)*—Third Judicial Division
JUNEAU (D-3)*—First Judicial Division
SELDOVIA (B-2)*—Third Judicial Division
SELDOVIA (B-6)*—Third Judicial Division
SELDOVIA (C-3)*—Third Judicial Division
VALDEZ (B-4)*—Third Judicial Division
VALDEZ (C-6)*—Third Judicial Division

Arizona-Utah

DINNEHOTSO*—Apache

Arkansas-Oklahoma

GREENWOOD*[2]—Sebastian
VAN BUREN*[2]—Crawford

California

BACHELOR VALLEY[1] — Stanislaus
CACTUS—Imperial
CLAYTON—Contra Costa
DEL MAR[1]—San Diego
DENVERTON[1]—Solano
FAMOSO[1]—Kern
GRANITE CHIEF—Placer
GRAYS WELL—Imperial
HONKER BAY[1]—Solano
LAKE MATHEWS—Riverside

* Indicates 15-minute quadrangle; all others are 7½-minute quadrangles.
[1] Indicates a revised map. [2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

LAKEVIEW—Riverside
MIDWAY—Alameda
MT. PINCHOT*—Fresno
MT. WILSON—Los Angeles
OAKDALE[1]—Stanislaus
OCOLITA—Imperial
OGILBY*—Imperial
RIDGECREST*—Kern
SUNNYMEAD—Riverside
WATERFORD[1]—Stanislaus

Colorado

DOLORES PEAK—Dolores
MOUNT WILSON—Dolores
PLACERVILLE—San Miguel

Connecticut

WINDSOR LOCKS[1]—Hartford

Connecticut-Rhode Island

VOLUNTOWN[1]—New London

Delaware

NEWARK EAST—New Castle

Florida

BASINGER NW—Highlands
BASINGER SW—Highlands
BRIGHTON NW—Highlands
BRIGHTON SW—Glades
CYPRESS LAKE—Osceola
DUNDEE—Polk
FORT BASINGER—Highlands
LAKE HATHCINEHA—Polk
LAKE JUNE IN WINTER — Highlands
LAKE POINSETT SW—Osceola
LAKE TOHOPEKALIGA — Osceola
NARCOOSSEE—Osceola
NARCOOSSEE SE—Osceola
OKEECHOBEE 1 SW — Okeechobee
ST. CLOUD NORTH—Osceola
ST. CLOUD SOUTH—Osceola
TAYLOR CREEK NE — Okeechobee
TAYLOR CREEK NW — Okeechobee
VENUS NW—Highlands

Hawaii

HALEIWA—Honolulu
KOKO HEAD—Honolulu

Idaho

MENAN BUTTES†—Madison
THOUSAND SPRINGS† — Gooding

Illinois

MANHATTAN[1]—Will

Illinois-Indiana

BEECHER EAST—Will

Indiana

BROWNSBURG—Hendricks
FREDERICKSBURG — Washington
LA FONTAINE—Wabash
LEROY—Lake
PEORIA—Miami
ROSSTON—Boone
WANATAH—LaPorte
WESTFIELD—Hamilton

Indiana-Kentucky

CANNELTON—Perry
DERBY—Perry

Kansas

GLASCO—Cloud
ST. MARYS—Pottawatomie
SIMPSON—Mitchell
STOCKTON—Rooks
WAMEGO—Pottawatomie
WEBSTER DAM—Rooks

Kentucky

ARGILLITE—Greenup
BIG CREEK—Clay
CADIZ—Trigg
CENTERVILLE—Bourbon
COLFAX—Rowan
CYNTHIANA—Harrison
GARFIELD—Breckinridge
GRADYVILLE—Adair
HEIDELBERG—Lee
LAMASCO—Lyon
LIVINGSTON—Rockcastle
MINTONVILLE—Casey
MOREHEAD—Rowan
NEW COLUMBUS—Owen
OLYMPIA—Bath
PARROT—Jackson
PLEASANT RIDGE—Daviess
SADIEVILLE—Scott
SAINT CATHERINE—Washington
STURGEON—Owsley
SUMMER SHADE—Metcalf
VERSAILLES—Woodford
WRIGLEY—Morgan

Kentucky-Indiana

MADISON EAST—Jefferson

Kentucky-Ohio

GREENUP—Greenup

Louisiana

CARVILLE—Iberville
CHATHAM*—Jackson
LEESVILLE*[1]—Vernon
LOBDELL—West Baton Rouge
PIGEON BAY—Iberville

Maine

STOCKHOLM*[1]—Aroostook

Maryland

ABERDEEN—Harford
CHESTERTOWN[1]—Kent
CURTIS BAY[1]—Arundel
HAVRE DE GRACE—Harford
LAUREL[2]—Prince Georges
LOVE POINT[1]—Queen Annes

Maryland-Pennsylvania

BLUE RIDGE SUMMIT[1]—Franklin
SMITHSBURG[1]—Washington
TANEYTOWN[1]—Carroll

Massachusetts

HOLLISTON[1]—Middlesex
ONSET[1]—Plymouth

Massachusetts-Rhode Island

BLACKSTONE[1]—Worcester

Michigan

LEWISTON*[2]—Montmorency
OTSEGO LAKE*[2]—Otsego

Minnesota

BOULDER LAKE RESERVOIR —St. Louis
BROOKSTON NW—St. Louis
CANYON—St. Louis
INDEPENDENCE—St. Louis
PAYNE—St. Louis

Missouri

PILOT GROVE NORTH—Cooper

Montana

BIG BEND SCHOOL—Chouteau
CARTER—Chouteau
EAGLE BUTTES—Chouteau
LONE TREE COULEE — Chouteau
O'HANLON COULEE—Chouteau
ROCKY LAKE—Chouteau
VERONO—Chouteau

Nevada

HIGHLAND PEAK—Lincoln

New Jersey

MILLVILLE—Cumberland

New Jersey-Pennsylvania

BORDENTOWN*[2]—Burlington

New Mexico

ALIRE—Rio Arriba
BLAND—Los Alamos
CAPITOL PEAK*—Socorro
CARRIZOZO*—Lincoln
FRIJOLES—Sandoval
GUAJE MOUNTAIN — Los Alamos
MOCKING BIRD GAP*—Socorro
NAVAJO PEAK—Rio Arriba
OJO CALIENTE—Taos
PAXTON SPRINGS†—Valencia
PUYE—Rio Arriba
VALLE GRANDE PEAK—Rio Arriba
VALLE TOLEDO—Sandoval
VALLECITOS—Rio Arriba
WHITE ROCK—Los Alamos

New York

BORDEN—Steuben
CAMPBELL—Steuben
CHATHAM—Columbia
ROMULUS—Seneca
STOTTVILLE—Columbia
WOODHULL—Steuben

New York-Pennsylvania

CATON—Steuben

Ohio

AURORA—Portage
BETHEL—Clermont
CHARDON—Geauga
GOSHEN—Clermont
HUDSON—Summit
SOUTH RUSSELL—Geauga
WEST VIEW—Cuyahoga

Ohio-Kentucky

LAUREL—Clermont
MOSCOW—Clermont

Oregon

CATHLAMET BAY—Clatsop
GEARHART—Clatsop
GREEN MOUNTAIN—Clatsop
OLNEY—Clatsop
TILLAMOOK HEAD—Clatsop

Oregon-Washington

ASTORIA—Clatsop
WARRENTON—Clatsop

Pennsylvania

CHAMBERSBURG*[2]—Franklin
CURTISVILLE—Allegheny
LANGHORNE[1]—Bucks
ROSEVILLE—Tioga
SHAMOKIN*—Northumberland

Pennsylvania-New Jersey

LAMBERTVILLE[1]—Mercer

Rhode Island-Connecticut

WATCH HILL[1]—Washington

South Dakota

BEND—Meade
HAMILL NE—Lyman
HEREFORD—Meade
HEREFORD NE—Meade
HEREFORD SE—Meade
IONA NW—Lyman
NEW UNDERWOOD NW—Meade
NEW UNDERWOOD SW—Pennington
RAPID CITY 1 NE—Meade
RAPID CITY 1 NW—Meade
RAPID CITY 1 SE—Meade
RAPID CITY 1 SW—Meade
VIEWFIELD—Meade

Tennessee

BEECH BLUFF—Madison
CANTERTOWN—Warren
CLAYBROOK—Madison
COOKEVILLE EAST—Putnam
COOKEVILLE WEST—Putnam

COTTONTOWN—Sumner
DYER—Gibson
HUNTSVILLE—Scott
MAYNARDVILLE[1]—Union
ORLINDA—Robertson

Tennessee-Kentucky
EAGAN—Claiborne
KETCHEN—Scott

Texas
DAMON—Brazoria
GUY—Fort Bend
McBRIDE—Carson
NEEDVILLE—Fort Bend
POMEROY—Carson
SANFORD—Hutchinson

Utah
BOUNTIFUL PEAK—Davis
DUGWAY PASS—Juab
DUGWAY RANGE NE—Tooele
FARMINGTON—Davis
MANCOS MESA*—San Juan
MOUTH OF DARK CANYON*—San Juan
NATURAL BRIDGES* — San Juan
NINEMILE KNOLL—Beaver
NUTTERS HOLE*—Uinta

Vermont
IRASBURG*[1]—Orleans
ISLAND POND*[1]—Essex
JAY PEAK*[1]—Orleans
MEMPHREMAGOG*[1]—Orleans

Washington
BRINNON—Jefferson
CAMANO—King
CENTER—Jefferson
EAGLE GORGE—Jefferson
EDMONDS WEST—Snohomish
LOFALL—Kitsap
LONG ISLAND—Pacific
MASON LAKE—Mason
MAXWELTON—Island
MT. WALKER—Jefferson
NORDLAND—Jefferson
OCEAN PARK—Pacific
OMAN RANCH—Pacific
PORT GANBLE—Kitsap
PORT LUDLOW—Jefferson
PORT TOWNSEND NORTH—Jefferson
PORT TOWNSEND SOUTH—Jefferson
SUQUAMISH—Kitsap
UNCAS—Jefferson
UPPER NASALLE RIVER—Pacific

Washington-Oregon
CAPE DISAPPPOINTMENT—Pacific
CHINOOK—Pacific
KNAPPTON—Pacific
ROSBURG—Wahkiakum

West Virginia-Kentucky
BURNAUGH—Boyd
DELBARTON—Mingo
PRICHARD—Wayne

Wisconsin
DOERING (P)*—Lincoln

Wyoming
‡ALADDIN—Crook
ATLANTIC CITY—Fremont
BARRAS SPRINGS—Fremont
‡CARLILE—Crook
CHRISTINA LAKE—Fremont
CONY MOUNTAIN—Fremont
DEL MONTE RIDGE—Fremont
DISHPAN BUTTE—Fremont
DRY FORK RANCH—Johnson
FORT RENO—Johnson
FOSSIL HILL—Fremont
GRAVEL SPRING—Fremont
HOE RANCH—Johnson
LONE HAYSTACK MOUNTAIN—Carbon
LOUIS LAKE—Fremont
MAVERICK SPRING†—Fremont
‡MISSOURI BUTTES—Crook
MOUNT ARTER SE—Fremont
NATWICK SW—Platte
RADIUM SPRINGS—Fremont
RAWLINS NW—Carbon
SAND DRAW—Fremont
SAVAGETON—Campbell
SINCLAIR—Carbon
SQUAW ROCK—Platte
‡STORM HILL—Crook
‡STRAWBERRY HILL—Crook
‡SUNNY DIVIDE—Crook
SWEETWATER GAP—Fremont
SWEETWATER STATION—Crook
THE NIPPLE—Campbell
YELLOWSTONE RANCH—Fremont

Wyoming-South Dakota
‡THE FORKS—Crook

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska-Canada
SUMDUM

North Carolina
BEAUFORT
ROCKY MOUNT

North Carolina-South Carolina
CHARLOTTE

North Carolina-Virginia
GREENSBORO

North Carolina-Virginia-Tennessee
WINSTON-SALEM

South Carolina-North Carolina
FLORENCE
SPARTANBURG

Virginia-North Carolina
NORFOLK

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between December 1, 1954, and February 28, 1955. The class or purpose of the survey is indicated. Copies of the plats may be secured from the Bureau Offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington, D. C.

Alaska
Fielding Lake Group—U. S. Survey 3299
Halibut Point Group—U. S. Survey 3317
Lake Minchumma Group—U. S. Survey 3315
Pennock Island Group—U. S. Survey 3316
Slaughter Creek Group—U. S. Survey 3306
Tangle Lakes Group—U. S. Survey 3298

Alaska—Seward Meridian
T. 12 N., R. 3 W.—subdivision of sec. 15
T. 12 N., R. 3 W.—subdivision of sec. 27
T. 19 N., R. 3 E.—subdivision of sec. 26
T. 20 N., R. 5 E.—subdivision of sec. 35

Alaska—Fairbanks Meridian
T. 1 N., R. 1 W.—subdivision of sections
T. 1 S., R. 1 W.—subdivision of sections
T. 1 S., R. 2 E.—extension survey

Arkansas—Fifth Principal Meridian
T. 13 N., R. 10 W.—dependent resurvey

California—Mount Diablo Meridian
T. 6 N., R. 16 E.—tract surveys

California—San Bernardino Meridian
T. 2 N., R. 6 E.—dependent resurvey and extension survey
T. 2 N., R. 7 E.—dependent resurvey

Florida—Tallahassee Meridian
T. 58 S., R. 35 E.—dependent resurvey, south boundary

Idaho—Boise Meridian
T. 8 S., R. 23 E.—supplemental survey of secs. 8 and 17

Michigan—Michigan Meridian

T. 7 S., R. 8 E.—subdivisional survey

Montana—Principal Meridian

T. 1 N., R. 32 E.—partial dependent resurvey
T. 1 N., R. 33 E.—partial dependent resurvey
T. 27 N., R. 49 E.—extension survey
T. 27 N., R. 50 E.—extension survey
T. 28 N., R. 49 E.—extension survey
T. 1 S., R. 32 E.—partial dependent resurvey
T. 1 S., R. 33 E.—partial dependent resurvey
T. 2 S., R. 32 E.—partial dependent resurvey
T. 2 S., R. 33 E.—partial dependent resurvey
T. 3 S., R. 32 E.—partial dependent resurvey
T. 3 S., R. 33 E.—partial dependent resurvey
T. 6 S., R. 32 E.—partial dependent resurvey

Nebraska—Sixth Principal Meridian

T. 3 N., R. 32 W.—partial dependent resurvey
T. 4 N., R. 28 W.—partial dependent resurvey
T. 4 N., R. 29 W.—partial dependent resurvey
T. 4 N., R. 30 W.—partial dependent resurvey
T. 4 N., R. 31 W.—partial dependent resurvey
T. 4 N., R. 32 W.—partial dependent resurvey
T. 4 N., R. 33 W.—partial dependent resurvey
T. 5 N., R. 33 W.—partial dependent resurvey

North Dakota—Fifth Principal Meridian

T. 147 N., R. 70 W.—partial dependent resurvey
T. 147 N., R. 71 W.—partial dependent resurvey
T. 148 N., R. 71 W.—partial dependent resurvey

Utah—Salt Lake Meridian

T. 38 N., R. 21 E.—extension survey
T. 39 N., R. 21 E.—extension survey
T. 30 S., R. 16 E.—fragmentary survey
T. 39 S., R. 7 W.—partial dependent resurvey

Wyoming—Sixth Principal Meridian

T. 29 N., R. 67 W.—partial dependent resurvey
T. 29 N., R. 68 W.—partial dependent resurvey
T. 30 N., R. 67 W.—partial dependent resurvey
T. 30 N., R. 68 W.—partial dependent resurvey
T. 30 N., R. 69 W.—partial dependent resurvey
T. 31 N., R. 67 W.—partial dependent resurvey
T. 31 N., R. 69 W.—partial dependent resurvey
T. 31 N., R. 70 W.—partial dependent resurvey
T. 55 N., R. 100 W.—supplemental survey
T. 55 N., R. 101 W.—supplemental survey

Wyoming—Wind River Meridian

T. 4 N., R. 2 E.—supplemental survey, secs. 2, 11, and 12
T. 4 N., R. 2 E.—supplemental survey, secs. 29 and 32
T. 4 N., R. 3 E.—supplemental survey, secs. 27, 34, 35, and 36

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Bldg., Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States.

7.—Lake Michigan. General chart of the entire lake, at 1 : 500,000 scale. (December 1954.)

62.—St. Marys River. Lake Munuscong to Sault Ste. Marie, including Lake George, at 1 : 40,000 scale. (January 1955.)

73.—Lake Michigan. Coast chart, Algoma, Wis., to 18 miles south of Sheboygan, Wis., with insets of Kewaunee, Wis., and Two Rivers, Wis., at 1 : 10,000 scale. (September 1954.)

74.—Lake Michigan. Coast chart, 10 miles north of Port Washington, Wis., to Waukegan, Ill., at 1 : 120,000 scale, with insets of Port Washington, Wis., Kenosha, Wis., and Waukegan, Ill., at 1 : 10,000 scale. (January 1955.)

415.—Rouge River, Mich., Detroit River to Ford Motor Co. plant, at 1 : 10,000 scale. (December 1954.)

745.—Racine Harbor, Wis., at 1 : 10,000 scale. (September 1954.)

751.—Chicago lake front, from Wilmette, Ill., to Gary, Ind., and Chicago Sanitary and Ship Canal to Lockport, Ill., with inset of Gary Harbor, Ind., at 1 : 15,000 scale. (September 1954.)

New Editions of Isogonic Charts

NEW EDITIONS have just been published of charts 3077 and 3069b showing the distribution of magnetic declination (variation of the compass) and rates of change throughout the United States and Alaska and their adjacent areas for the 1955 epoch, Rear Admiral R. F. A. Studds, Director, Coast and Geodetic Survey, U. S. Department of Commerce, recently announced.

The new editions are the most recent of a long series of magnetic charts published by the Coast and Geodetic Survey and will be of special interest to the navigator, surveyor, prospector, and the scientist. The lines of equal magnetic declination and equal annual change shown on the charts have been completely redrawn from the latest available information, including not only natural changes occurring since the previous editions, but also additions from the Bureau's extensive file of observational data.

Both charts are published at the scale of 1:5,000,000. Copies may be obtained from the sales agents, district offices, and the Washington office of the Coast and Geodetic Survey. The price is 40 cents each.

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments on published material or the presentation of new ideas in an informal way.
—EDITOR

THE PECULIAR POWER OF A SURVEYOR

LOUIS N. A. SEEMANN*—I would like to comment on Mr. Merriam's "Thoughts of a Grandfather" in the January–March 1955 issue of SURVEYING AND MAPPING.

Having a B. S. degree in forestry and being just recently registered in Louisiana as a land surveyor, I read the section on special registration for land surveyors with avid interest.

Indeed, a surveyor must be part engineer and part lawyer; but he must also be a part that is peculiar only to surveyors.

This peculiar power of a surveyor consists of knowing where to dig for the remains of a stump or monument and then being able to identify those remains. That is, he must dig deep and frequently for bits of charred or rotten wood to identify the called-for bearing trees. He must be able to name with certainty bits of charred or rotten wood, flakes of rusted pipe or iron rod, or even crumbled rock or concrete used in monumenting a property corner or General Land Office subdivision. Also, he must have the ability to project himself into the past and walk beside the original surveyor and figure where he may have made an error in chaining or bearing; he must also decide why certain things were done in a certain way. This ability to identify obscure objects on the ground cannot be stressed too strongly.

All these bits of evidence, when properly tagged and explained, become the surveyor's legal "exhibits." The engineer must then put these identifying "exhibits" together into a unified whole by proper and accurate methods. Until all this has been done no land survey has been made.

As long as it is a matter of measuring and there is no need for identifying points and lines of ownership or the legal documentation of ownership, the job is strictly civil engineering.

* Land Surveyor, Huttig, Ark.

GREAT PONDS AND PRIVATE PONDS

HARRY E. SCOTT*—The following notes with reference to a *great pond* and a *private pond* may be of interest to ACSM members. As defined by the General Laws of the Commonwealth of Massachusetts, a *great pond* contains ten acres or more, and a *private pond* contains less than 10 acres. (The distinction between the two is important because the great ponds are open to the public, by law, and right-of-way for public access to them must be considered. —EDITOR)

In a recent survey of land in Berkshire County, Mass., involved in a dispute between adjoining owners, item 1 was the area of a pond known as Harmon Pond and the proper classification as defined by law, quoted above. Various surveys and records give different acreages for the pond as shown below:

The land court of Boston, 1880 ...	14	acres
Geological Survey	11.2	acres
Department of Agriculture	7.4	acres
Department of Agriculture (air photo), July 2, 1952	6.33	acres
Local surveyor, 1944	9.2	acres
My own survey (I have air photo), 1954	9.5	acres

The extreme variation of more than 100 percent (7.67 acres) indicates that the pond area fluctuates. All surveys having been made by qualified surveyors, it is not likely that the varia-

* Consulting Civil Engineer, Westfield, Mass.

tions are entirely due to errors of measurement. However, differences in water level on different dates would account for the differences in area.

From the evidence obtained and from the definition cited, it appears that Harmon Pond, situated partly in Sheffield and partly in South Egremont, was a *great pond* in 1880 and a *private pond* in 1944, 1952, and 1954.

Referring to another pond in Massachusetts, immortalized by Henry David Thoreau in his book "Walden or Life in the Woods," Thoreau states on page 162, "The pond has risen steadily for two years and now in the summer of 1852 is just five feet higher than when I lived there, or as high as it was thirty years ago, and fishing goes on again in the meadow." Thoreau was an excellent surveyor as well as a great philosopher and student of nature.

C. S. MALTBY†—The records cited by Mr. Scott are of interest to many, for various reasons. The sportsman seeking a place to introduce his young son to a live wild fish, or one who has an uncontrollable urge to frighten a migrating duck on his way—both would welcome the knowledge that a pond is open to public use. The Geological Survey topographer in the field has little if any interest in the ownership, but does have the problem of mapping the shoreline and seeking out the cabin hidden in the cool shadows of a spruce or pine. The cartographer who faithfully draws the inlet, outlet, and shoreline from a stereoscopic model produced by aerial photography cannot see the fish jump for a bug, the small boy behind a stump getting ready for a swim in his birthday suit, or the deer getting his morning coffee, but he must look for the trail to the shore, the boat dock, and the cottage in the woods. He then reduces his findings to statistics and symbols, and produces a map.

The Geological Survey has published two maps of the area that includes the pond under discussion, Harman Marsh Pond, not far from Great Barrington, Mass. The first, the Sheffield quadrangle, scale 1:62,500, was surveyed in 1884 by field methods—and is not necessarily accurate by today's standards. The second is the Egremont quadrangle, scale 1:31,680, compiled by photogrammetric methods from aerial photographs, presumed to be accurate in detail —such as the pond outline in question—to close tolerances.

The area of the pond, measured on the Sheffield 1884 map, is 12.3 acres. At this scale, the pond area is small, and the area measurement is no more reliable than the reconnaissance

† Staff Engineer, U. S. Geological Survey.

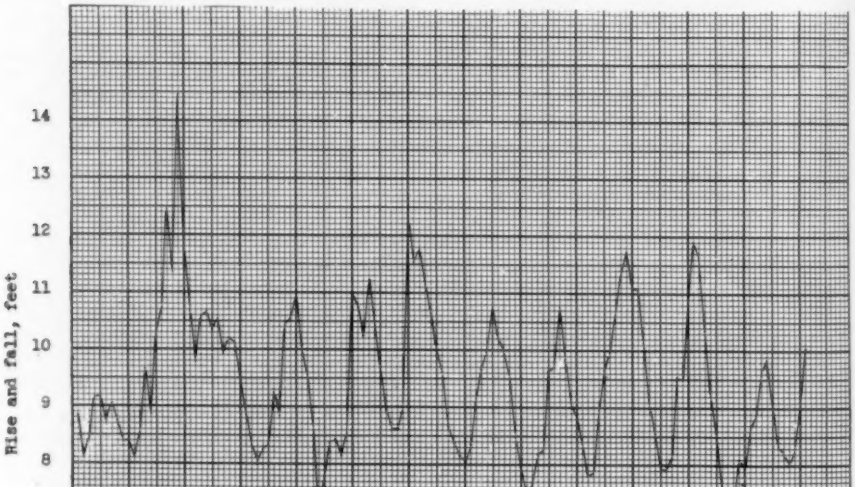

FIGURE 1.—Water-table variations, Test Well No. 3, Great Barrington, Mass.

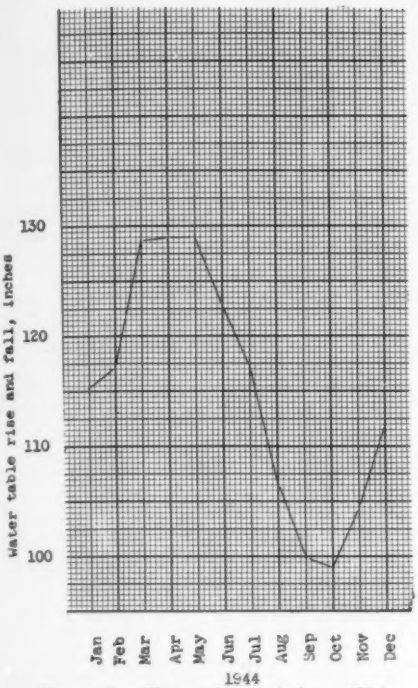

FIGURE 2.—Water-table variations, 1944.

survey methods. The same pond shown on the Egremont quadrangle also is small. The original compilation, scale 1:5,000, however, is still available, and the area has been determined from it very easily and accurately. This compilation sheet shows that the pond covered 7.7 acres when the aerial photos were made—11:00 a.m., February 13, 1944. These acreages confirm Mr. Scott's conclusion that the water area has decreased. Further confirmation appears on the Egremont map, as there is a swamp at the inlet end of the pond. If the water level were raised enough to flood the swamp, the area would be increased to about the original figure.

Use of aerial photographs for direct measurement would require knowledge of the exact scale of the photograph in that particular area. Photogrammetric procedures reduce all parts of the photographs to a common scale, and would, therefore, seem to be authoritative sources of area data. For fixed-size, clearly defined objects, that assumption is correct. For water bodies, it may or may not be. The shoreline may be obscured; the boundary between water and marsh may be indefinite; but more important, the level of the water fluctuates with the season, the water table of the area, and with the whims of the operator if controlled by a dam and spillway. To use photographs or maps made from them in lieu of ground measurements, these factors must be known, and then the area adjusted to a mean, or else pinned to the day and hour of the photography. The same is true of the ground or field survey—the area computed from a traverse around the shore is good only for the conditions prevailing on the day the work was done.

The variations of the water table, or underground water supply, are usually reflected in the surface-water variations. Records from the Geological Survey Water Resources Division test well No. 3 at Great Barrington are represented by the graph in figure 1 for an 11-year period beginning in 1944. The stage was about

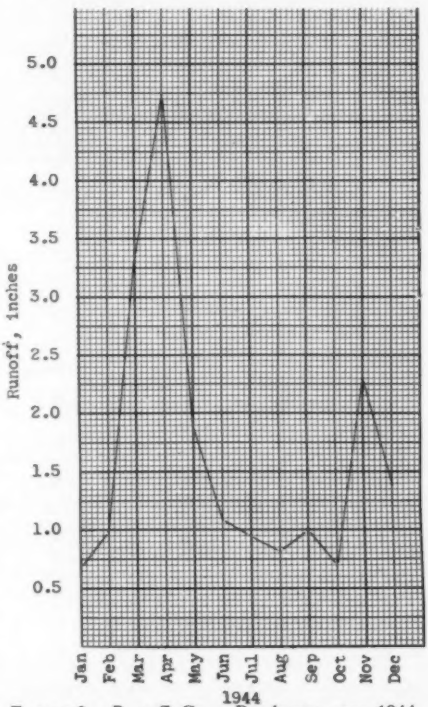

FIGURE 3.—Runoff, Great Barrington area, 1944.

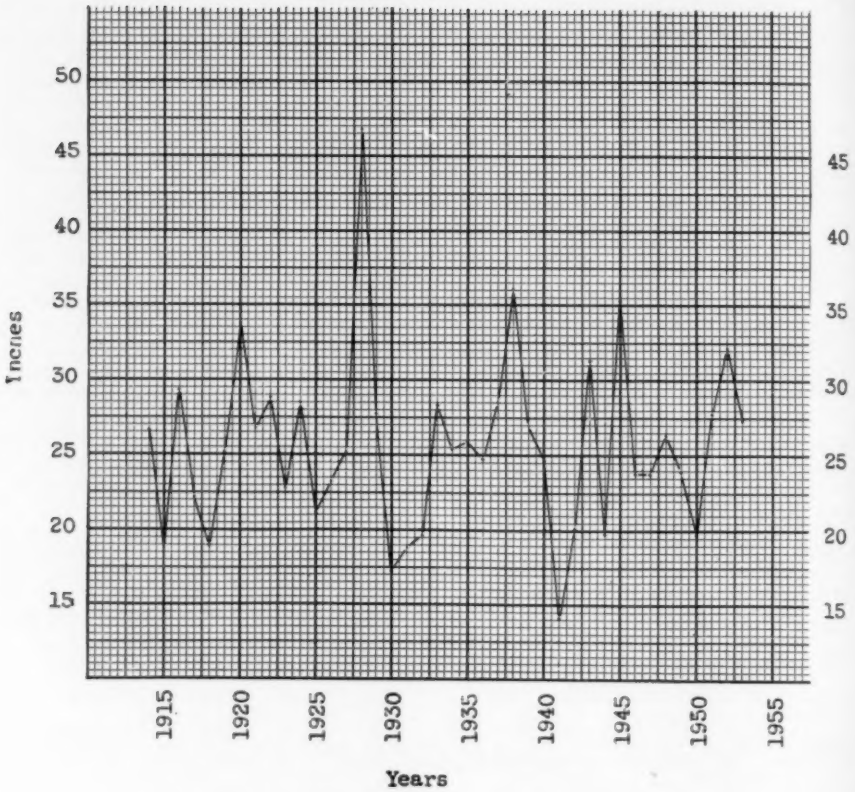

FIGURE 4.—Annual runoff, Gage 333, Housatonic River.

average in February one year, 1953, above average 5 years, and below, 5 years. Figure 2 is prepared from the same data to show the trend at the time of the Geological Survey aerial photography.

Runoff of surface water is shown in figures 3 and 4. Figure 3 shows the peak runoff to have been in April in 1944, and data not illustrated shows that the peak usually occurs in April—35 years out of the 47 for which records are available—and that the runoff in February was below the annual average 37 years out of the 47.

Figures 1 and 4 show that during each year there are sufficient variations from month to month in the water table to materially affect the surveys quoted by Mr. Scott.

This is to be expected in a northern State where streams and ponds are below average during the colder months, and high, normally, when spring thaws and spring rains contribute materially to both surface and underground water supplies.

The data do not, however, show any definite trend that would explain a permanent change in the area of Harman Pond. The latest map shows, in addition to swamp area at the head of the pond, some indication that there may have been a dam below the pond. If a survey were made when the marsh was submerged by seasonal high water, or while the level was raised by a dam, the water area would be increased sufficiently to account for the 1880 and 1884 areas.

USE OF THE MAGNETIC COMPASS IN TRINIDAD

PHILIP DOUGLIN*—It was with great interest that I read your Oct.–Dec. 1954 issue (Vol. XIV, No. 4) of SURVEYING AND MAPPING and my congratulations are extended to W. Cunnyngham for his discourse on "Making Land Surveys and Preparing Descriptions to Meet Legal Requirements." His article was very instructive and comprehensive and, to a surveyor not trained in the USA, most interesting for comparative reasons.

There was, however, a certain part of this article which attracted my attention especially, not because it more or less conflicted with what I read in a previous issue, but because we in Trinidad, B.W.I., make use of the magnetic needle to a great extent, so any matter written about it would naturally attract our attention. Of course I am fully aware of the fact that "opinions or assertions expressed in articles in the journal do not necessarily represent the official views of the Congress," and, furthermore, Mr. Cunnyngham in fact quoted from *Henrie* v. *Hyer*, 70 P. 2d. 154, 158 (Utah, 1937) *sic:* "It (the magnetic compass) is an instrument helpful for finding general directions but not reliable when accuracy is required, nor is it used except for checking purposes in surveys."

About a year ago I read in SURVEYING AND MAPPING a fine treatise[1] on the use of the magnetic compass in the USA. This article was literally "devoured" by the local surveyors who saw it, and, in general, there was a sort of welcome and comforting sense of confirmation among us regarding the accuracy and reliability of the "needle."

I am a member of ACSM and am at present on vacation here in New York City. There is quite a lot I can say regarding my experience with the magnetic compass. I hope that, soon after my return home, I shall be able to prepare an article on the use of the magnetic compass in Trinidad and Tobago, trusting that it would be of interest to members and readers alike.

This I might say about the compass: If a surveyor adopts the proper observing procedure and takes the necessary precautions regarding local attraction, etc., the bearings of the individual survey lines, as well as the angular misclosure of the traverse, would satisfy the accuracy and precision of most rural land, route, and stadia surveys.

* Licensed land surveyor, Lands and Surveys Dept., Trinidad and Tobago.

[1] HUEY, S. E., "Surveying With the Magnetic Compass," July–Sept. 1952. *See also* comments on this article by J. H. Nelson, Jan.–Mar. 1953, p. 102; and W. P. Johnson, April–June 1953, p. 235.

MACHINE METHOD FOR AREA COMPUTATIONS

B. GOUSSINSKY*—The method described by Henry G. Weissenstein,[1] and usually known under the name of its inventor as the Elling method, is certainly one of the most notable advancements in the technique of surveying computations, and every surveyor should adopt it in his office. The economy is tremendous, reducing the cost to a fraction of what it was before.

Forms are presented below which seem to be most suitable for the method. The efficiency of these forms has been proved by many years of experience.

Instead of listing the coordinates in the usual way, as in table 1, and then picking them out by jumping over one place when passing from the coordinates of the index $k-1$ to those of $k+1$, the arrangement of the coordinates on paper is made in a zigzag form (table 2). The scheme can be put in either a single- or a double-column form. The latter (table 3) is somewhat more convenient for writing down and checking the coordinates; the first is more uniform.

TABLE 1.—*List of Coordinates*

Point	*y*	*x*
1	148.37	257.41
2	279.84	218.83
3	264.18	114.75
4	116.21	72.10
5	17.21	116.81
6	48.11	186.61

* Survey of Israel, Tel Aviv, Israel.

[1] WEISSENSTEIN, HENRY G., Simple Machine Method for Area Computations, SURVEYING AND MAPPING, January–March 1954, pp. 75–79.

As each of the two results (one direct and one in the form of a complementary number) obtained from the machine gives double the required area, a check is required also on halving the figures. This too is shown, in the example below table 3.

All operations are thus self-checking, and after the coordinates as data have been checked by an independent computer, the result is errorproof.

TABLE 2.—*One-Column Form*

Point	*y*	*x*
1	148.37	
2		218.83
3	264.18	
4		72.10
5	17.21	
6		186.61
6	48.11	
1		257.41
2	279.84	
3		114.75
4	116.21	
5		116.81
6	48.11	
6		186.61
1	148.37	
2		218.83

TABLE 3.—Two-Column Form

Point	*y*	*x*	*y*	*x*
1	148.37			257.41
2		218.83	279.84	
3	264.18			114.75
4		72.10	116.21	
5	17.21			116.81
6		186.61	48.11	
6	48.11			186.61
1		257.41	148.37	
2	279.84			218.83

$2A =$	64,930.2487	$A =$	32,465.1244
(9999)	35,069.7513		17,534.8756
	100,000.0000		50,000.0000

STADIA CONVERSION TABLES IN GRADS

S. A. BAUER*—The October–December 1954 issue of SURVEYING AND MAPPING contained a discussion entitled "Why Grads?" by C. F. Merriam. As a follow-up on this discussion, I submit the following table which was computed for use with a Wild T–1 instrument graduated in the centesimal system. The table may be used in the same manner as the tables given in standard engineering texts for determining horizontal distances and differences in elevation from stadia readings.

* Past President, ACSM.

–	100g	101g	102g	103g	104g	105g	106g	107g	108g	109g	–
.00	0.00	1.57	3.14	4.71	6.27	7.82	9.37	10.91	12.43	13.95	1.00
.05	0.08	1.65	3.22	4.78	6.35	7.91	9.46	10.99	12.51	14.03	.95
.10	0.16	1.73	3.30	4.86	6.43	7.99	9.54	11.06	12.58	14.10	.90
.15	0.24	1.81	3.37	4.94	6.50	8.06	9.61	11.14	12.66	14.18	.85
.20	0.31	1.88	3.45	5.02	6.58	8.14	9.69	11.22	12.74	14.25	.80
.25	0.39	1.96	3.53	5.10	6.66	8.22	9.77	11.29	12.81	14.33	.75
.30	0.47	2.04	3.61	5.17	6.74	8.30	9.84	11.37	12.89	14.40	.70
.35	0.55	2.12	3.69	5.25	6.82	8.37	9.92	11.45	12.97	14.48	.65
.40	0.63	2.20	3.76	5.33	6.89	8.45	10.00	11.52	13.04	14.55	.60
.45	0.71	2.28	3.84	5.41	6.97	8.53	10.08	11.60	13.12	14.63	.55
.50	0.79	2.35	3.92	5.49	7.05	8.61	10.15	11.68	13.19	14.70	.50
.55	0.86	2.43	4.00	5.57	7.13	8.68	10.23	11.75	13.27	14.78	.45
.60	0.94	2.51	4.08	5.64	7.21	8.76	10.31	11.83	13.35	14.85	.40
.65	1.02	2.59	4.16	5.72	7.28	8.84	10.38	11.91	13.42	14.93	.35
.70	1.10	2.67	4.24	5.80	7.36	8.92	10.46	11.98	13.50	15.00	.30
.75	1.18	2.75	4.31	5.88	7.44	8.99	10.54	12.06	13.58	15.08	.25
.80	1.26	2.83	4.39	5.96	7.52	9.07	10.61	12.13	13.65	15.16	.20
.85	1.33	2.90	4.47	6.04	7.60	9.15	10.69	12.21	13.73	15.23	.15
.90	1.41	2.98	4.54	6.11	7.67	9.23	10.77	12.29	13.80	15.31	.10
.95	1.49	3.06	4.63	6.19	7.75	9.30	10.84	12.36	13.88	15.38	.05
1.00	1.57	3.14	4.71	6.27	7.82	9.37	10.91	12.43	13.95	15.45	.00
H.D.	99.98	99.90	99.78	99.61	99.38	99.11	98.80	98.43	98.01	97.55	
+	99g	98g	97g	96g	95g	94g	93g	92g	91g	90g	+

–	110°	111°	112°	113°	114°	115°	116°	117°	118°	119°	–
.00	15.45	16.94	18.41	19.86	21.29	22.70	24.09	25.45	26.79	28.10	1.00
.05	15.52	17.01	18.48	19.93	21.36	22.77	24.16	25.52	26.86	28.17	.95
.10	15.60	17.09	18.55	20.00	21.43	22.84	24.23	25.58	26.92	28.23	.90
.15	15.67	17.16	18.63	20.07	21.50	22.91	24.29	25.65	26.99	28.30	.85
.20	15.75	17.23	18.70	20.14	21.57	22.98	24.36	25.72	27.05	28.36	.80
.25	15.82	17.31	18.77	20.22	21.64	23.05	24.43	25.79	27.12	28.43	.75
.30	15.90	17.38	18.84	20.29	21.71	23.12	24.50	25.85	27.18	28.49	.70
.35	15.97	17.45	18.92	20.36	21.78	23.19	24.57	25.92	27.25	28.56	.65
.40	16.04	17.53	18.99	20.43	21.85	23.26	24.63	25.99	27.32	28.62	.60
.45	16.12	17.60	19.06	20.50	21.92	23.33	24.70	26.05	27.38	28.68	.55
.50	16.19	17.68	19.13	20.57	22.00	23.40	24.77	26.12	27.45	28.75	.50
.55	16.27	17.75	19.20	20.64	22.06	23.46	24.84	26.19	27.51	28.81	.45
.60	16.34	17.82	19.28	20.71	22.13	23.53	24.91	26.25	27.58	28.88	.40
.65	16.41	17.90	19.35	20.79	22.20	23.60	24.97	26.32	27.64	28.94	.35
.70	16.49	17.97	19.42	20.86	22.27	23.67	25.04	26.39	27.71	29.01	.30
.75	16.56	18.04	19.50	20.93	22.34	23.74	25.11	26.46	27.78	29.07	.25
.80	16.64	18.12	19.57	21.00	22.41	23.81	25.18	26.52	27.84	29.14	.20
.85	16.71	18.19	19.64	21.07	22.48	23.88	25.25	26.59	27.91	29.20	.15
.90	16.79	18.26	19.71	21.14	22.55	23.95	25.31	26.66	27.97	29.27	.10
.95	16.86	18.34	19.79	21.21	22.63	24.01	25.38	26.72	28.04	29.33	.05
1.00	16.94	18.41	19.86	21.29	22.70	24.09	25.45	26.79	28.10	29.39	.00
H.D.	97.04	96.49	95.89	95.24	94.55	93.81	93.04	92.22	91.35	90.45	
+	89°	88°	87°	86°	85°	84°	83°	82°	81°	80°	+

–	120°	121°	122°	123°	124°	125°	126°	127°	128°	129°	–
.00	29.39	30.65	31.88	33.07	34.23	35.36	36.45	37.51	38.53	39.51	1.00
.05	29.45	30.71	31.94	33.13	34.29	35.41	36.50	37.56	38.58	39.56	.95
.10	29.52	30.77	32.00	33.19	34.34	35.47	36.56	37.61	38.63	39.60	.90
.15	29.58	30.84	32.06	33.25	34.40	35.53	36.61	37.66	38.68	39.65	.85
.20	29.64	30.90	32.12	33.30	34.46	35.58	36.66	37.71	38.73	39.70	.80
.25	29.71	30.96	32.18	33.36	34.51	35.63	36.71	37.77	38.78	39.75	.75
.30	29.77	31.02	32.24	33.42	34.57	35.69	36.77	37.82	38.82	39.79	.70
.35	29.83	31.08	32.30	33.48	34.63	35.74	36.82	37.87	38.87	39.84	.65
.40	29.90	31.14	32.36	33.54	34.68	35.79	36.87	37.92	38.92	39.89	.60
.45	29.96	31.20	32.42	33.59	34.74	35.85	36.92	37.97	38.97	39.93	.55
.50	30.02	31.27	32.48	33.65	34.80	35.90	36.98	38.02	39.02	39.98	.50
.55	30.09	31.33	32.54	33.71	34.85	35.96	37.03	38.07	39.07	40.03	.45
.60	30.15	31.39	32.60	33.77	34.91	36.01	37.08	38.12	39.12	40.08	.40
.65	30.21	31.45	32.65	33.83	34.96	36.07	37.14	38.17	39.17	40.12	.35
.70	30.27	31.51	32.71	33.88	35.02	36.12	37.19	38.22	39.22	40.17	.30
.75	30.34	31.57	32.77	33.94	35.08	36.18	37.24	38.28	39.27	40.22	.25
.80	30.40	31.63	32.83	34.00	35.13	36.23	37.29	38.33	39.31	40.27	.20
.85	30.46	31.70	32.89	34.06	35.19	36.29	37.35	38.38	39.36	40.31	.15
.90	30.53	31.76	32.95	34.12	35.25	36.34	37.40	38.43	39.41	40.36	.10
.95	30.59	31.82	33.01	34.17	35.30	36.40	37.45	38.48	39.46	40.41	.05
1.00	30.65	31.88	33.07	34.23	35.36	36.45	37.51	38.53	39.51	40.45	.00
H.D.	89.51	88.53	87.51	86.45	85.36	84.23	83.07	81.87	80.65	79.39	
+	79°	78°	77°	76°	75°	74°	73°	72°	71°	70°	+

₹ ₹ ₹

Mason-Dixon Map Presented to Princeton Library

WHAT is believed to be part of an original manuscript copy of the historic Mason-Dixon surveys has been presented to the Princeton University Library.

There is no other known segment of the original manuscript.

The surveys were made between 1763 and 1767 by two British astronomers, Charles Mason and Jeremiah Dixon, and ended a long boundary dispute between the Baltimores and the Penns, proprietors of pre-Revolution Maryland and Pennsylvania. The term "Mason and Dixon Line" was used to designate the boundary between the free and slave States in the North-South dispute leading up to the Civil War.

The gift to the Princeton library actually is a complete map of the surveys and was presented by Mr. and Mrs. John H. Doran of Kingston, Pa., in memory of their son, Joseph I. Doran, Prineeton '35.

Comprising two large sections, the complete

map was thought at first to be one of three surviving engraved copies of the Mason-Dixon surveys. But a long study by experts has revealed that, while the western section is an engraved copy, the other section is evidently an original manuscript of the eastern boundary.

The two sheets were acquired by Mr. Doran's father in 1864, and their previous history is not known.

To identify the "Doran Copy," Princeton's librarian, Dr. William S. Dix, called on Thomas W. Streeter of Morristown, N. J., president of the American Antiquarian Society and a well-known collector of Americana, who himself owns one of the existing Mason-Dixon engravings.

Reporting his finding in the current issue of the university's *Library Chronicle,* Mr. Streeter said: "We found that the western sheets of the two copies were the same and printed on paper with the same watermark, but that there were various minor differences between the eastern sheets. Word came from Princeton that intensive study had made it evident that the eastern sheet of the Doran copy was in manuscript and not engraved at all."

Mr. Streeter added that no one interested in the Doran map had been able to solve the riddle of why one part was engraved and the other was in manuscript.

The Maryland-Pennsylvania boundary dispute, which the two surveyors finally ended, spanned eighty years of early American history. It began in the Sixteen Eighties when it was suggested to Lord Baltimore that he name representatives to negotiate with agents of William Penn to make a "true division and separation of the said provinces of Maryland and Pennsylvania."—Reprinted by permission from *The New York Times,* Nov. 1, 1954.

The Map Is the Anchor to All Our Imaginings

(EDITOR'S NOTE.—The following is from "How Robert Louis Stevenson Wrote *Treasure Island,*" a preface to *Treasure Island,* by Harry Hansen.)

Treasure Island began with a map, as it deserved to, for the map is the anchor to all our imaginings; without it there would have been no plot, and without it Long John Silver and his ragamuffin crew would scarcely have embarked on the *Hispaniola.* For the map of Treasure Island grew easily out of Stevenson's fancy and with it came the inspiration to meet the demand of his stepson and write "something craggy to break his mind upon." We know that the map occupied a big place in the scheme because one of the last essays which Stevenson wrote at Vailima, "My First Book," goes exhaustively into its origin. . . . And here it is:

> On one of these occasions, I made the map of an island; it was elaborately and (I thought) beautifully colored; the shape of it took my fancy beyond expression; it contained harbors that pleased me like sonnets; and, with the unconsciousness of the predestined, I ticketed my performance "Treasure Island." I am told there are people who do not care for maps, and find it hard to believe. The names, the shapes of the woodlands, the courses of the roads and rivers, the prehistoric footsteps of man still distinctly traceable up hill and down dale, the mills and the ruins, the ponds and the ferries, perhaps the "Standing Stone" or the "Druidic Circle" on the heath; here is an inexhaustible fund of interest for any man with eyes to see or twopence-worth of imagination to understand with! No child but must remember laying his head in the grass, staring into the infinitesimal forest and seeing it grow populous with fairy armies. Somewhat in this way, as I paused upon my map of "Treasure Island," the future character of the book began to appear there visibly among imaginary wood; and their brown faces and bright weapons peeped out upon me from unexpected quarters, as they passed to and fro, fighting and hunting treasure, on these few square inches of a flat projection. The next thing I knew I had some papers before me and was writing out a list of chapters. . . .

The tale began with a map, but the map began without a story, and harbors, inlets, hill-tops, beaches came into existence for no reason whatsoever. So enamoured was Stevenson of the map that when he came to write the tale it seemed to have ineradicable contours. There was the place he had called Skeleton Island, without knowing why—for that a skeleton had to be provided. There were two harbors, and that physical fact alone prompted the voyage of the *Hispaniola* under the unfortunate guidance of Israel Hands.

News of Related Organizations

Indiana Society of Professional Land Surveyors

The third annual Indiana Land Surveyors' Conference, held on the Purdue Campus on Friday and Saturday, January 21 and 22, was a very successful one. Approximately 120 persons interested in land surveying registered for the two-day meeting. This was an increase of almost 100 percent over the attendance of the past two years.

Besides enjoying good weather, we were fortunate in having a program which will be hard to duplicate or to outdo in the future—Edward Flickinger of the Federal Housing Administration described methods and procedures in subdivision planning; Adrian Marks of Frankfort, pinchhitting for Professor Grimes who was ill, discussed relationships between the surveyor and abstractor; Fred Williams of K&E demonstrated the new optical tooling equipment; Prof. Lloyd Kemmer discussed observations for true meridians; W. J. Robbins, representing Lloyds of London, described the surveyor's liability; Sidney Park of Louisville discussed the use of aerial surveys; a panel of our own members, consisting of Messrs. Condra, Fickle, Morthland, Nicewander, and Scholl, discussed the computing of charges for land surveys; and members Kidder and Condra, representing the Examinations and Legislation Committees, respectively, gave reports.

We are indebted to a number of surveying-equipment and supply companies for their exhibits. These included the Keuffel and Esser Co. of Chicago, the Eugene Dietzgen Co. of Chicago, the Brunson Instrument Co. of Kansas City, the Lufkin Rule Co. of Saginaw, the Crofoot Nielson Co. (Fennel Instrument Co.) of Chicago, and the Abrams Aerial Survey Co. of East Lansing.

The secretary reports that there are now approximately 150 members of the Indiana Society of Professional Land Surveyors. The organization is growing very rapidly as more land surveyors become aware of its existence and worth. Already we are seeing some accomplishment from the Examinations and Legislation Committees.

(Editor's Note.—The Board of Direction of ACSM, at its meeting on March 11, 1955, approved the affiliation of the Indiana Society of Professional Land Surveyors with ACSM.)

—Ken S. Curtis
Executive Secretary

Maryland Surveyors Discuss Legal Aspects of Land Surveying

The Second Annual Conference on Surveying and Mapping in Maryland was held on April 14, 1955, in the Engineering Building of the University of Maryland. The meeting, sponsored by the Maryland Bureau of Control Surveys and Maps, in cooperation with the College of Engineering of the University of Maryland, was attended by 146 registered participants despite adverse weather conditions. In addition, student groups attended as their school schedules permitted. A total of eleven commercial firms participated in the conference by exhibiting equipment and material pertaining to surveying and mapping.

The conference, devoted to the theme of "Legal Aspects of Land Surveying," brought together for the first time in Maryland representatives of the engineering and legal professions, with the idea of promoting a better understanding of the problems of land-title work confronting both groups.

The morning session of the conference was

opened by the presiding officer, George W. Cassell, of the Maryland Bureau of Control Surveys and Maps. Dean S. S. Steinberg, Dean of the College of Engineering, followed with introductory remarks regarding the conference. Dr. Wilson H. Elkins, President, University of Maryland, was then introduced to deliver the welcome address.

The morning session speakers were Walton G. Banks, President of the Maryland Society of Surveyors, who spoke on the surveyor's view of the conference theme; Judge Wm. J. McWilliams, attorney-at-law, Annapolis, Md., who gave the lawyer's view of the theme subject; and Robert B. Kelm, attorney-at-law and title examiner for the Maryland Title Guarantee Company, who delivered the title company's view of the subject. A general discussion from the floor on the papers presented by the speakers was conducted.

The afternoon session was in the form of a panel discussion, again using the conference theme as the subject. The panel discussion was moderated by Draper K. Sutcliffe, Maryland Department of Public Improvements. The panel members were: Annarose C. Sleeth, attorney-at-law, Towson, Md.; Wilson C. Warren, registered land surveyor, Baltimore, Md.; E. Duval Taliaferro, Vice President, Suburban Title and Investment Corporation, Washington, D. C.; and August H. Wagener, Vice President, Maryland Society of Surveyors, Glen Burnie, Md. Papers were presented by each panel member including the moderator, and discussion of these papers was held.

The entire conference indicated that although both the surveyors' and lawyers' problems in land-title work are numerous, benefits to both groups can be obtained through mutual cooperation whereby a greater and more satisfactory service can be rendered to their clients. It is indicated that such mutual cooperation will result from the conference.

Copies of the proceedings of the conference are available upon request from Maryland Bureau of Control Surveys and Maps, 307 Tower Building, Baltimore 2, Md.

—GEORGE W. CASSELL

East Bay Council on Surveying and Mapping

The East Bay Council on Surveying and Mapping held a regular meeting on the evening of March 17, 1955.

The program for the evening was a panel discussion of California State Senate Bill 1167, which proposes that photogrammetrists be absolved of the requirement of the present law that they be licensed as civil engineers. Council Chairman Harry H. Shatto served as moderator of the panel in the absence of Prof. Francis H. Moffitt who was ill.

Charles O. Greenwood began the discussion with a general statement of the issues, then gave his reasons for opposing the bill. Arguments in favor of the bill were presented by Harrison C. Ryker. Logan N. Muir followed with further opinion against the bill.

After further discussion from the floor, the conclusion was reached that it would be inappropriate for the East Bay Council to go on record with a vote either in support of or in opposition to the bill because the Council consists essentially of representatives from surveying and mapping organizations, and these representatives could not present the views of their organizations without authorization. The opinion was expressed that this was a proper subject for action by an organization of individual surveyors such as the two California sections of the American Congress on Surveying and Mapping.

At the business session preceding the panel discussion, Chairman Shatto accepted, with regret, the resignation of C. A. Wooldridge, Jr., who had been serving as Secretary of the East Bay Council. Mr. Wooldridge introduced George Buscher who has been delegated as his successor as representative on the Council from the Alemeda County Surveyors Office.

In an effort to provide relief and assistance to the Secretary, the Council decided that the reporting of the monthly meetings of the Technical Committee and the publication of the technical reports should be separated from the secretarial function. Robert Brougher, from the City of Hayward, who has been active in the work of the Technical Committee, was appointed to take over these duties.

—BRUCE B. GRANT
Acting Secretary

Wisconsin Society of Land Surveyors

(The following information is abstracted from the *Newsletter* of the Wisconsin Society of Land Surveyors dated April 30, 1955.—ED.)

REPORT OF THE LEGISLATIVE COMMITTEE

At the annual meeting of the Wisconsin Society of Land Surveyors in December 1954, the Society decided to sponsor the bill providing for registration of land surveyors of the State. State Senator Trinke, long a supporter of registration, enthusiastically undertook sponsorship and has done much to promote the bill in the legislature.

The Board of Directors of the Society, in an effort to expedite the bill, engaged Francis Lamb, attorney, to serve as legislative counsel. Mr. Lamb, who is legislative counselor for several other organizations as well, has acted as liaison between the Legislative Committee and the legislature.

Hearings on the bill have been held before the Committee on Judiciary, which recommended the bill for passage, and before the Joint Finance Committee, where the going has been much harder. Superfluous amendments have been offered, perhaps in an effort to amend the bill to death, and opposition in other forms has been evident.

SIXTH SURVEYORS INSTITUTE

Subdividing and platting was the main subject of the Sixth Wisconsin Surveyors Institute, held at the University of Wisconsin on December 1 to 3, 1954. Thirty-eight surveyors were present.

The entire first day was spent on subdivision planning, starting with a discussion by Prof. L. F. Rader of how subdivisions must fit a city's general street plan. Prof. Longenecker of the University Horticulture Department called attention to many considerations of planning a subdivision for beauty and good living utility. The entire afternoon was given over to a discussion of three different plans for subdividing a 600-acre tract belonging to the University. Plans were presented by the Madison City Plan Commission, the State Planning Board, and the Federal Housing Administration, each of which had different and valuable characteristics.

The proposed amendment to the State's platting law was considered in detail on the afternoon of the second day under the able direction of Ray E. Behrens, Planning Director for Milwaukee County.

E. M. Emery and R. B. Sawtelle of the State Highway Commission staff explained how the Commission engineers locate highway rights-of-way and how descriptions and records of descriptions of these rights-of-way are handled.

Discussion leaders from outside the State included Prof. Charles S. Danner of the University of Illinois, who described his many experiences in land surveying, familiar yet different from those of the men attending; Commander G. C. Mast of the U. S. Coast and Geodetic Survey, who explained the State Plane Coordinate Systems as developed by the USC&GS and showed the many ways in which this system could be of help to surveyors; and Dr. Arthur D. Kidder of Indiana, who explained how the ordinary surveyor's transit could best be used to take observations on the sun and on Polaris.

The Institute closed with an enjoyable dinner, and an illustrated talk on the proposed Echo Park Dam in Utah by Prof. James Woodburn.

New Catalog on Technical Data Books

A NEWLY-REVISED catalog of Pocket Size Technical Data Books is announced by Lefax Publishers, Philadelphia, for engineers, technical workers, teachers, and students. In all, over 2,000 subjects are listed, including much newly-revised material, and technical developments covering every phase of engineering. The catalog may be obtained free on request. Among the subjects covered are the following of interest to ACSM members: Lumber Data, Building Construction, Reinforced Concrete, Piping Data, Surveying Tables, Highway Engineering, General Math, Math Tables, Physics, Trig-Log Tables, Mechanical Drawing, Machine Design, Machinist's Data, Mechanics of Materials, and Hydraulics.

Lefax Technical Data Books sell for $1.25 each or 6 books for $5.00. For free catalog, write to Lefax Publishers, Philadelphia 7, Pa.

CONGRESS NEWS

Annual Business Meeting

The American Congress on Surveying and Mapping convened at 3:40 p.m. on March 11, 1955, in the Terrace Banquet Room, Hotel Shoreham, Washington, D. C., for its annual business meeting, retiring President Carroll F. Merriam presiding. The following is the stenotypist's transcript of the proceedings:

PRESIDENT MERRIAM: My program says, "Opening Remarks." I am going to pass those over, as you will see, and I will have a few brief remarks just before I step down from the platform.

There will be reports from officers and I want to call first my running mate and the running mate of my successor, Vice President Wattles. It is a great pleasure to feel that a man can come from the Pacific Coast to serve effectively as Vice President of this organization. William C. Wattles.

VICE PRESIDENT'S REPORT

MR. WATTLES: Mr. Merriam has asked me to give a brief report, and it will be brief, of my activities as Vice President for this past year.

As a matter of fact, I was unable to do anything with reference to the eastern part of the United States by reason of the fact that I was unable to get here and participate in the activities of the Board of Direction of ACSM. However, I did maintain contact through correspondence and I wrote such reports and gave such opinions as I was asked to do, and, since I got no repercussions, I presume that they were satisfactory.

As far as the western part of the United States is concerned, I have been rather busy with the Local Sections out in California, both the Northern and the Southern Sections, assisting them in promoting their programs for the general development of activities connected with surveying and mapping.

It has been very pleasing to note that we are getting good reaction. Also, it has been pleasing to note our success in the western area, including the Rocky Mountains, where a new Section has been activated in Denver. I have had very gratifying reports from the Texas Section and the two Texas affiliates.

All in all, I don't think I have any criticism whatever to make and I feel that the coming year is going to be even better than this past year, by virtue of natural growth and the efforts of the various members and officers of the society.

SECRETARY'S REPORT

PRESIDENT MERRIAM: Next on the list is Secretary Dix, with whom I have tremendous pleasure in my frequent runs over from Baltimore. It has been a pleasure to serve with you, Mr. Dix. I know you will give a good report.

MR. DIX: Thank you.

Activities of ACSM as reported regularly in SURVEYING AND MAPPING, and as evidenced by the enthusiastic participation of the membership in this 15th Congress, are themselves a running report.

Reports from other officers and committeemen will amplify and augment as presented during this meeting. Doubling in brass this year, as both Secretary of ACSM and Chairman of the Fifteenth Annual Meeting for this adventure in consecutive meeting with our sister society, the American Society of Photogrammetry, has left little time for reports on action. Rather I would rest my case with you in judgment of the actions themselves.

I will, however, touch on a few items. The Colorado Section of ACSM was activated during the past year, as was the Louisiana Section of ACSM. The proposed constitutions and bylaws of these two Sections have been reviewed and found in compliance with objective principles and requirements under the provisions of ACSM Constitution and Bylaws, and their actual charter requires but the ACSM Board approval at this evening's Board meeting.

Surveyor-group affiliations are also active. A petition by the Indiana Society of Professional

Land Surveyors has been similarly reviewed and found to be in good order, as was its proposed constitution. It remains only for Board approval this evening to effect that affiliation.

We have notice of intent to affiliate from the Cape Cod Society and an interest in affiliation from the Illinois Association.

South Carolina has formed a State group. Colorado and Nevada indicate active interest, as does Oklahoma.

Now that W. B. Williams passes the chairmanship of the Property Surveys Division to Gordon Ainsworth, it seems most likely he will accept an interim appointment to activate the Great Lakes Region Section of ACSM whose petition was approved, as you remember, during the Fourteenth Annual Meeting.

All in all, we continue to grow in numbers and in stature, a steady, healthy growth.

AWARD OF HONORARY LIFE MEMBERSHIP

MR. DIX: Another item and I am through. We have received a petition in good order for the nomination of Marshall S. Wright, Sr., to Honorary Life Membership in ACSM, which requires only the parliamentary approval by the Board this evening to authorize the affixation of the seal. Token presentation could be made, Mr. President, during this meeting, if Mr. Wright is present, and the finishing touches applied later.

Will you kindly stand, Mr. Wright?

(Applause.)

PRESIDENT MERRIAM: It is with great pleasure, because I have known you, Mr. Wright, for many years as a dear personal friend, that I have the honor to confer upon you the Life Membership in this Congress.

MR WRIGHT: I can tell you this is a complete surprise. Normally, I believe, the recipient of any award is tipped off in advance so that he can have his extemporaneous speech all prepared, but in this case, I can assure you that I knew nothing about it. I am a little bit overcome and I certainly appreciate the honor. Thank you.

(Applause.)

ELECTION RESULTS

MR. DIX: For the parliamentary record, I would like to have the report of the results of the February election read at this meeting and to do that, I would like to call on Albert Kalbfleisch.

MR. KALBFLEISCH: The following are the results of the election of officers: For President, Lester C. Higbee, Troy, N. Y.; for Vice President, William C. Wattles, Santa Barbara, Calif. The Past President, Mr. Merriam, will automatically be a two-year Director. Elected Directors are: Charles H. Andregg, Bethesda, Md.; Frank S. Borden, Washington, D. C.; Robert H. Lyddan, Washington, D. C.; William H. Wilson, Houston, Tex.; and C. H. Wooldridge, Jr., of Carmel, Calif.

TREASURER'S REPORT

PRESIDENT MERRIAM: No organization can run without money. The money must be handled by a treasurer, so I'm going to call upon Maj. Richard T. Evans for the Treasurer's report.

MAJ. EVANS: The Treasurer has no written report because at this time it would certainly be meaningless. The peak load is right now with the dues coming in. For several reasons, we did not get the bills out as early as we wanted to, so that the dues are being paid at this time.

Later, you will hear from Captain Borden in greater detail as to the membership status, as he is the Chairman of the Membership Committee, and then in the April–June issue of the journal will appear Mr. Amstadt's detailed report of the financial situation.

It will suffice for me to say that the ACSM treasury is in a healthy condition. The receipts have been exceeding the expenditures regularly and will continue to do so.

(Applause.)

PRESIDENT MERRIAM: There are standing committees which I will call on although some of these may have no report. I will start with the Committee on Budget. Mr. Amstadt.

(No response.)

PRESIDENT MERRIAM: On the Constitution, Marshall S. Wright, Sr., do you have a report on that?

MR. WRIGHT: No.

PRESIDENT MERRIAM: I know that Mr. Wright has been terrifically busy, and we have had to go along with operations and we have been trying to bring a new constitution into shape. I believe that is correct.

MR. WRIGHT: Yes.

PRESIDENT MERRIAM: I know a little bit what the situation is. Committee on Map Use, Walter Stoneman?

(No response.)

MEMBERSHIP COMMITTEE REPORT

PRESIDENT MERRIAM: I know we will have a report on membership because I had a

very cheering letter during the year speaking of the progress and increase in membership from Capt. Frank S. Borden, a man who can be depended upon for a cheery note.

CAPTAIN BORDEN: Gentlemen, as in previous years, the Membership Committee report will consist of two parts. First, a brief statistical report; and, secondly, the awarding of citations to seven of our members who have done outstanding work in furthering the growth of the Congress.

The paid membership of ACSM for 1954 was 3,307. This was made up of 2,650 old members, plus 657 new members. Thus far, in 1955, 346 new members have been added, making a total of 3,653. Adding to this approximately 240 library and 18 sustaining members, brings our total membership to about 3,900.

In previous reports, we have emphasized the seriousness of the high percentage of delinquency and stated that this had been reduced in the previous year from 15 percent to 13 percent, and we hoped to further reduce it. I can now report that during the past year it has been reduced to 9½ percent.

For those of our members who are willing to assist actively in the effort of the Membership Committee, I would like to suggest that they read the article on page 255 of our journal, April–June 1954, entitled "Why Join a Professional Society?"

In this article, James F. Fairman, a former president of the New York Society of Professional Engineers answers such questions as: Why should I join your Society? What will I get out of it? He expresses his conviction that membership in an organization such as ours is an opportunity for service.

He believes that the individual owes a great deal more to his profession than the profession owes to him. One paragraph of his article seems particularly appropriate at this time, just as ACSM and ASP are about to conclude a very successful experimental week of consecutive meetings. Mr. Fairman answers particularly the question, or rather the statement, that is often made: "Yes, but I cannot afford to pay dues in more than one society." To this, Mr. Fairman counters:

> My friend, your income and your disposition of it are none of my business, but have you ever stopped to figure what percent of your income you return in the form of dues to professional societies, and have you ever contrasted that with the annual cost of your cigarettes or whatever vices or pleasures you indulge in? Do you place a value on your profession adequately represented by your dues? Suppose it became necessary for you to belong to a union in order to practice your profession? What do you think your dues would be and what would you get for them?
>
> In the meagerness of the dues we pay to our professional societies, do we not ourselves set our own values on our professional organizations and, if we do not value them any higher, why should we be surprised if the public places no higher value on our profession?

The second part of the report will be the awarding of citations to seven of our members who have done an excellent job in furthering the growth of this society. It might be noted by some of the members that there has been quite a change in the locality of these as compared to previous years.

This year, we have an upsurge in Northern California, whereas, heretofore, the Southern Californians have carried away the banner of California and, I might say, as perhaps some of you know, California, not Texas, leads in membership. There are more members in California than any other State including the District of Columbia. For that reason, I take special pride in announcing the names—I think there is one of them here—of California members awarded citations: C. J. Aggeler, City College of San Francisco; George C. Bestor of Carmel, Calif.; Harley A. Waterfall, San Francisco, Calif.; and C. A. Wooldridge, Jr., of Carmel, Calif.

Moving a little eastward, we come to Colorado where J. E. Mundine, U. S. Geological Survey, will receive an award. Coming farther east, we come to Washington, D. C., and Joseph Dunich of the U. S. Coast and Geodetic Survey will be awarded a citation, and then going practically to the east coast, we have Prof. Paul P. Rice of Rutgers University, New Brunswick, N. J. In connection with the award to Professor Rice, I would like to add that Professor Rice is the Secretary-Treasurer of the Land Surveyors Division of the New Jersey Society of Professional Engineers and he claims modestly that he has had very great cooperation from that organization in helping him to develop the growth of ACSM in New Jersey, and that is borne out by the statistics.

I think we have with us today, C. A. Wooldridge, Jr. I want him to come forward with Professor Rice and Joseph Dunich, those being the only three present.

I doubt if all of our members present know exactly what the award is or how it reads, so I'm going to take the time to read one of them:

To whom all these presents shall come, greetings: Know ye that herewith is awarded to Prof. Paul P. Rice an honorary award for services rendered to the American Congress on Surveying and Mapping for procurement of new members, thereby advancing the interest of the profession and actively contributing to the growth and development of the organization.

(The awards were presented to Messrs. Rice, Wooldridge, and Dunich.)

(Applause.)

PUBLICATIONS COMMITTEE REPORT

PRESIDENT MERRIAM: Now, it is a pleasure to call a strong team who have well served the Congress—the Chairman of the Publications Committee, Morris M. Thompson, and the Editor-in-Chief, Robert C. Eller. I wonder if Mr. Thompson and Mr. Eller would both come forward.

MR. THOMPSON: The work of the Publications Committee during the past year is evidenced by the last four issues of SURVEYING AND MAPPING. These issues of the journal are, in essence, the Committee Report. I don't believe there is any need to elaborate on the Committee's activities any further.

I would, however, like to offer some comments on the contents of the journal and on the prospects for the coming year.

Ideas on what kind of material should be printed in SURVEYING AND MAPPING differ widely. There are some who advocate that the journal should be devoted primarily to the presentation of new theory and new developments on the frontiers of our science, and others who believe that we should concentrate on articles that tell how to get a job done by tried and true methods. There are many shades of opinion in between. I think the conclusion is obvious. The membership of ACSM covers many fields of interest and our journal should therefore have an omnibus makeup—something for everybody. That has been the policy of the present Publications Committee.

We feel also that while the dignity and authoritativeness of SURVEYING AND MAPPING should be maintained at the highest level, this does not mean that the magazine need be stuffy. To this end we have sought to provide a reasonable proportion of lively material—news items of the Sections and related organizations, comment-and-discussion papers, and assorted brief items of interest. We think it appropriate to use an occasional full-length article in a lighter vein, such as the one published last March entitled "From the Diary of an Old-Timer." That article concerned itself with a surveyor and the crowd of critics who followed him about to see if he knew what he was doing. As far as we could tell, it was very favorably received. We would be glad to publish more articles of the same nature if our old-timers, and new-timers, will dig into their rich stores of experience and send them in.

Speaking of sending in articles, I wish to make it plain that it is not necessary to have a special invitation to submit material to SURVEYING AND MAPPING. We welcome, appreciate, and carefully consider all articles received from whatever source.

President Merriam stated the other day that, as far as the journal is concerned, we are about to swap horses. That is quite true, but I want to make it clear that the swap is not being made in mid-stream. Rather, we will have a double team at work for the remainder of this year, the time required to cross the stream. I have been given the green light to tell you about the nature of the swap although it is theoretically contingent on official approval by the Board. I can state then, that by the end of 1955, Robert C. Eller will retire as Editor-in-Chief, to be succeeded by Howard S. Rappleye.

It would be difficult to overstate the debt of gratitude that this society owes to Bob Eller. For a period of 3 years he has devoted long hours to editing our journal, evening after evening, weekend after weekend. His editorial craftsmanship has been of the highest order, as anyone can see simply by examining the journal. It is certainly a source of regret to this Congress that Bob Eller is forced by the pressure of other responsibilities to relinquish the editorship; truly, he has been a "big wheel" in this organization.

There is, however, a bright side to the coin, for in Howard S. Rappleye we have an editor-designate who is well qualified to carry on the high standards established by Aaron L. Shalowitz and Robert C. Eller.

I can also state that Charles A. Whitten has consented to succeed me as Chairman of the Publications Committee. I am indeed happy to know that the affairs of this committee will be left in such capable hands. I know that it will be a pleasure for Bob Eller and myself to dovetail our activities with those of Messrs. Rappleye and Whitten so that the transition from one team to another can be made smoothly and not in mid-stream.

Finally, I want to express my personal ap-

preciation for the opportunity to serve as chairman of this committee. It has been a most rewarding experience.

(Applause.)

REPORT OF EDITOR-IN-CHIEF

MR. ELLER: During the year 1954 there were no major changes made in the journal, SURVEYING AND MAPPING. The four regular quarterly issues were published, comprising a total of 528 pages. Included were 52 principal articles, 52 "filler" items, and 126 ads, as well as the six regular departments which appear in each issue.

Reprints were prepared during the year for 17 articles, including the 4 lists of "New Members." Reprints are obtained and sold on an at-cost basis, as a courtesy to authors and others who desire them.

Considerable effort was devoted during the year to enlarging the staff of assistant editors and to training them in all phases of the editorial work. There are now four assistant editors: Richard E. Niswander of the Coast and Geodetic Survey, Bernard Schechter of the Army Map Service, Quentin S. Johnson of the Engineer Research and Development Laboratories, and John B. Rowland of the Geological Survey.

Through the help of these gentlemen, the work of the editor has been considerably lightened and, more important, a better journal is resulting in that each article is reviewed and worked on by at least two members of the staff, rather than one as in the past.

One of the significant projects accomplished during the year was the preparation of a Manual of Instructions for Editors. This pamphlet, recently completed, describes the work of the editorial staff and gives general and specific rules to follow in editorial work. It should become a valuable aid in the training of future members of the staff.

Emphasis has been given, during the year, to expanding and improving those several departments of the journal in which almost all members have an interest—Book Reviews, Comment and Discussion, News of Related Organizations, and Congress News. As a result, these departments have been expanded overall, to the extent that 50 percent more space was devoted to them in 1954 than in 1953.

Another important project was the preparation, by Mr. Niswander, and the publication in the January–March 1954 issue, of the 2-year cumulative index covering volumes XII and XIII.

Advertising in the journal yielded, for the year, a gross income to ACSM of about $2,900.00. Deducting from this the proportionate share of presswork cost and text-stock cost, the net profit resulting from advertising becomes about $2,200.00, a significant contribution to the financial well-being of the Congress, and one which helps to defray the increasing cost of publishing the journal.

I would like to take this opportunity to state my position with respect to the kind remarks of Mr Thompson.

It would be ridiculous for me to deny that the job of Editor-in-Chief takes a lot of time and hard work. But I feel that nothing—nothing really worthwhile, that is—is gained without effort. I would not be completely honest if I said I enjoyed every minute of it. But I can say, without hesitation, that, overall, I have enjoyed the assignment immensely and found it to be a most satisfying experience.

I would like to thank the Congress for the privilege of serving in this capacity and for the honor that goes with it. Through this position I have met and come to know many fine people in the profession.

I would like to thank the assistant editors for their good work and able assistance. I would like to thank the officers of the organization—in particular, President Merriam, Secretary Dix, Captain Borden, and Mr. Thompson—for their splendid cooperation, wise guidance, and moral support.

With reference to the appointment of Mr. Rappleye as editor-designate, I have no worries; I feel certain that the journal will be in good and competent hands.

(Applause.)

PRESIDENT MERRIAM: The interest with which I have opened the envelopes which I have received from Mr. Eller and Mr. Thompson vouches for my seconding the reports which they have given.

Now, Public Relations. I believe we have Benjamin E. Beavin. Any report?

MR. BEAVIN: I think public relations are in good order but I have no formal report.

REPORT OF ANNUAL MEETING COMMITTEE

PRESIDENT MERRIAM: For the Annual Meeting Committee we have Secretary Dix.

MR. DIX: I say, let the meeting stand on itself.

(Applause.)

PRESIDENT MERRIAM: We will now

have a few words from the Division Chairmen. Cartography Division, Mr. Dunich.

CARTOGRAPHY DIVISION

MR. DUNICH: Mr. President, this is a resolution[1, 2] submitted by the Division on Cartography:

Whereas, the journal, SURVEYING AND MAPPING, has grown to the extent that it now takes a place among the top professional publications, and in view of the ever-increasing amount of work required to maintain and increase its standing among professional publications;

It is hereby recommended that the Board of Direction of the Congress give consideration to establishing the position of Editor-in-Chief of SURVEYING AND MAPPING as a paid position.

Thank you.

PRESIDENT MERRIAM: Inasmuch as the Chairmen of the Technical Divisions are also automatically members of the Resolutions Committee, let me say that we met this noon. I believe we can save time if, when they come up, they bring the report of resolutions together with the report of the Divisions themselves. So, when each Chairman comes up, he may have remarks on behalf of the Division and also a resolution to submit.

Control Surveys Division, Prof. Milton O. Schmidt.

CONTROL SURVEYS DIVISION

PROFESSOR SCHMIDT: The Control Surveys Division is in, to use a trite phrase, a healthy condition. We are all getting along all right. We make a fair contribution to SURVEYING AND MAPPING and we feel we are continuing to grow and develop as we should.

This morning, the Committee adopted, by popular vote, the following resolution and directed that I should transmit this resolution to you, Mr. Chairman, for discussion and consideration by the Board of Direction at its afternoon meeting today.[2] Here is the resolution:

Whereas, the American Congress on Surveying and Mapping recognizes the broad engineering and planning requirements for the development and construction of the Interstate Highway System now being considered by the Congress of the United States and realizes the inefficiency and waste which can occur if adequately conducted and monumented control surveys are not available; and

Whereas, the American Congress on Surveying and Mapping recognizes the economic value of adequate control surveys not only for the planning and extension of highways, but for many other purposes; therefore, be it

Resolved, that the Director, U. S. Coast and Geodetic Survey, be requested to establish along the proposed routes of this interstate highway system at intervals of one to two miles permanent monuments resulting from horizontal, vertical, and azimuth control surveys of at least second-order accuracy, completing the surveys in advance of all construction where possible; and be it further

Resolved, that the Commissioner of Public Roads be requested to ask the responsible highway officials of all States concerned to connect all engineering and right-of-way surveys required for the construction of the highways to these permanent monuments and to furnish the data resulting from the establishment of any additional permanent monuments to the Coast and Geodetic Survey so that the results may be incorporated into the Federal networks of horizontal and vertical control, reduced to State plane coordinates and sea-level elevations, and thus be made available for future use by local, State, or Federal engineers.

I transmit this to you, Mr. Chairman, for your transmission to the Board of Direction.

PRESIDENT MERRIAM: I have to say a little bit about my double role. We counted on this to take place after the change of administration so I suppose it is not proper for me to make remarks as Chairman of the Resolutions Committee until after the shift has been made.

We will call on the Chairman of the Education Division, Brother Austin Barry.

EDUCATION DIVISION

BROTHER BARRY: Mr. Chairman, the educators who were present at the meeting of the Education Division and others are at the moment engaged in self-analysis and reevaluation. It is obvious to all that we do not intend that colleges shall cease teaching surveying. It is the intent of all that efforts be made to better this instruction and the Education Division has put together this resolution[2] which, in effect, conveys the sentiment of all members of the Education Division:

Resolved, that the American Congress on Surveying and Mapping encourage that the teaching

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[1] This resolution, given in the form of a recommendation to the Board of Direction from the Cartography Division, is thus considered to be a resolution of the *Division* rather than a *Congress* resolution.

[2] For a report on action of the Board of Direction on these resolutions, *see* pages 261 and 262.

of surveying and mapping in the colleges and universities be directed toward the development of mature professional judgment and ability rather than toward the perfection of individual techniques.

I transmit this resolution to you, Mr. Chairman.

PRESIDENT MERRIAM: Instruments Division, Dr. Talbert Abrams.

(No response.)

PRESIDENT MERRIAM: Property Surveys Division, Mr. Williams.

PROPERTY SURVEYS DIVISION

MR. WILLIAMS: The Property Surveys Division this year had, I think, the largest meeting that they have had, since I have been attending here at least, and I understand we have close to, if not slightly over, 50 percent of the membership of the Congress.

We passed two resolutions[3] this morning. Resolution number one:

Whereas, the resolution passed by the Property Surveys Division of the American Congress on Surveying and Mapping during the Fourteenth Annual Meeting in 1954 was approved and passed by ACSM, requesting the cooperation and efforts of the Federal Bureau of Public Roads with respect to the preservation and coordination of survey monuments on highway projects, particularly with regard to making ties to the United States Coast and Geodetic survey monuments and coordinate systems as developed for the various areas of the United States;

Whereas, the Bureau of Public Roads accepted the resolution and distributed to the various division offices of the Bureau suggestions and recommendations that the States be advised by these Bureau offices of the validity and value of adopting the principles and recommendations set forth by ACSM in the resolution; and

Whereas, the Construction Committee of the American Association of State Highway Officials has been informed of the support of the Bureau to the resolution;

Now, therefore, be it resolved, that ACSM express its appreciation to the Commissioner of Public Roads and the American Association of Highway Officials for their cooperation and support of ACSM and the steps taken to get the State Highway Departments to expedite the adoption of the principles of said resolution and that a copy of this action and resolution be transmitted to the Commissioner of Public Roads and the American Association of State Highway Officials.

Resolution number two is a companion resolution. These two supplement the resolution of the Control Surveys Division, as you will notice:

Whereas, location and construction surveys will have to be made for the National System of Interstate Highways, authorized in 1944 and now under consideration by the Congress of the United States as part of the President's Highway Program for the entire country;

Whereas, this 40,000-mile system of highways and surveys, therefore, would be connected throughout, thus joining all of the principal geographic and land-use regions of the United States;

Whereas, surveys for the location and design and construction of such a system of highways could serve as an extension and continuity of the established network of control surveys in the system of State plane coordinates computed therefor; and

Whereas, an efficient and effective way to accomplish objectives mutually beneficial to everyone is for the Congress of the United States to be fully cognizant of this benefit and to write the means of obtaining them into our laws; now, therefore,

Be it resolved, that the American Congress on Surveying and Mapping inform the responsible officials of the Executive Branch of the Federal Government, various State highway departments, and all others who may be directly affected by the action of the Congress of the United States for the engineering and construction of the National System of Interstate Highways, that the bill should contain a proviso that the surveys therefor should be tied to the established network of control surveys so that such highway surveys will become an integral part of the network.

These resolutions were somewhat hastily drawn, Mr. President, and I trust that our good friend, Mr. Dix, and such others as will have jurisdiction over them from here on, will make any corrections in the phraseology and the diction that they feel should be made.

PRESIDENT MERRIAM: I think they will take care of that. May I explain, as I mentioned before, the procedure is that the resolutions originate with the various Divisions and they will be voted upon under the presidency of the President-elect and as being recommended to the Board of Direction for action at its meeting which follows after this meeting.

There will be one more resolution, which was a general resolution, originating in the Resolutions Committee. I'm going to ask for the opportunity to present that after President Higbee takes the chair.

TOPOGRAPHY DIVISION

PRESIDENT MERRIAM: Earl J. Fennell,

[3] *See* footnote 2.

who is Chairman of the Topography Division, may have a report to make.

MR. DRUHOT: Mr. Chairman, Mr. Fennell had to leave to go back to the office and he asked me to say that there were no resolutions for the Division on Topography.

I might add, as incoming Chairman of this Division, that I certainly am in the market for any suggestions for future resolutions, if you have any, or for that matter for anything that might help us in working out topography.

I would also like to say that I certainly approve of Mr. Thompson's remarks here about material for SURVEYING AND MAPPING because I liked the particular paper that he mentioned. I read that and was very much interested and I would like to see a few more of those. Now, we are surveyors and, consequently, the bulk of the material must be surveying, but before being surveyors, we are also human beings and a little bit of humanity is rather interesting to have in the record.

(Applause.)

LOCAL SECTION REPORTS

PRESIDENT MERRIAM: I would also like to have a report from the Sections; the Southern California Section, Mr. Wattles, or any others from Southern California.

MR. WATTLES: Mr. Chairman, I seem to have to do a job of pinch hitting and extemporaneous speaking and everything else down here. John Jones, who is the Vice Chairman of the Southern California Section has been here for the past three or four days, but I believe he has left. He undoubtedly had a report prepared and he didn't say anything to me so I'm just going to give you a brief on the activities of the Southern California Section for this year.

In the past two years, we have had several educational meetings, including field days and also technical meetings with programs and exhibits. They have been extremely well attended and all of the members and nonmembers appear to be very happy over the results and we gained a lot of good information and a lot of good comradeship, which is essential, we believe, in the surveying and mapping professions.

We expect, under the leadership of our new Chairman, Bill Meek of the General Petroleum Corp. in Los Angeles, to have a further set of meetings of the same kind next year. We generally program four public meetings a year and we have, in the meantime, monthly or bimonthly meetings of our Board of Directors who carry through an agenda of promotion during the year.

We have some very excellent officers and we have done, in our opinion, a good job for our Section.

PRESIDENT MERRIAM: Now a report from Northern California. I know that Mr. Wooldridge will have something to say for us. It has been a pleasure to meet him here at this meeting. Mr. Wooldridge.

MR. WOOLDRIDGE: Thank you, President Merriam.

We have slated a big program which accounts for the sudden increase in membership for Northern California. Our constitution calls for two meetings a year, alternating between Sacramento and the Bay area, about 80 miles apart. Distance means nothing to us out there and a good many of our members travel that 80 miles to get to the meetings after work and go back home that evening, but that isn't enough. So this year, we have slated 25 meetings with more, probably, to be arranged later, reaching out to the various corners of Northern California. I think that is one of the big secrets: A lot of meetings and a lot of subjects of interest to the surveyors. We are sure finding a turnout and it has been very rewarding.

(Applause.)

PRESIDENT MERRIAM: It is very stimulating to the Congress to have Sections of this kind. Is anybody here from Colorado?

(No response.)

PRESIDENT MERRIAM: Louisiana?

Mr. Chapman, will you step forward.

MR. CHAPMAN: The Louisiana Section was organized during the past summer with 15 or 20 members with the help of Mr. Wilson from Houston. Mr. Higbee came down to get us off on the right foot and we will always be grateful.

We have had two quarterly meetings and programs of high caliber and we intend to continue this program for the next year. We plan on having good meetings and, in addition to that, we are trying to design a program to reach the people in the northern portion of the State, either by newsletter or by some other means.

Of course, in addition to that, we intend to increase our membership which today is something like 80 or 85 paid-up members.

(Applause.)

PRESIDENT MERRIAM: Now we may hear from Texas.

MR. WILSON: Mr. Chairman, fellow members, I had hoped that Mr. Sargent would be

here at this meeting this afternoon. He is the present Chairman of the Texas Section, but I don't see that he is here so I will pinch hit for him.

Very briefly, since it seems that California has stolen our thunder from the standpoint of numbers, we will probably have to fall back on something else. I was interested in the point that the Membership Committee Chairman made as to delinquencies. We worked very hard on that the past year and we are getting our delinquencies down to pretty low figures. As of December 31st, I think we had only six members who were delinquent in dues.

We had two major projects this past year: One, as you know, was the commemorative stamp for surveyors that we were sort of spearheading for the whole organization. Of course, we weren't trying to do it by ourselves.

We have not obtained a definite commitment from the Post Office Department, but we are still working on it and we will call on each and every one of you, not only for moral support, but also for active assistance, during the coming year.

The other matter that the Texas Section has worked on, in support of the Texas Surveyors Association, was a bill for a license for the surveyors of Texas. In Texas, anyone can be a surveyor—a blacksmith or what not. We have here this afternoon, E. D. Morse, who is the past president of the Texas Surveyors Association, and in this past year he has done some very fine work in getting the support of the surveyors in Texas behind this bill which, at the present time, has passed the committees of both State Houses. It has not yet been voted on the floor, but, you know, getting past your committees is a big hurdle.

I would like for Mr. Morse to stand up and be recognized for his very fine work.

(Applause.)

MR. WILSON: That is about all I have to say at this time except that the Texas Section is still alive and kicking and we are looking forward to an even better year in 1955.

RESOLUTION ON CONSECUTIVE MEETINGS

PRESIDENT MERRIAM: I am going to take the liberty, even though slightly out of order, to read the resolution which originated in the Resolutions Committee so that you will have the text of all the resolutions together to be voted upon under the presidency of President Higbee.

Whereas, it is the unanimous opinion of all of the Technical Division chairmen that this first consecutive meeting with ASP has, as far as can be seen at present, proven a success; and

Whereas, no member of the committee could recall intimation arising from the membership of their respective Divisions why consecutive meetings with ASP should not be held in the future;

Be it, therefore, resolved, by the membership of the American Congress on Surveying and Mapping, that the Board of Direction immediately give serious consideration to entering similar negotiations with ASP as soon as complete reappraisal of the respective advantages and possible disadvantages can be made.[4]

I know that there is a general good feeling that this meeting has been a success and has stood on its record and I think, if a vote were taken now, it would be unanimously in favor of saying "go ahead." I think that the course for this meeting now is to recommend that the Board of Direction give serious consideration to negotiations and to appraise as carefully as possible what disadvantages there might be so that the course ahead can be firmly carried on.

You have heard these resolutions which will be held until President Higbee takes the chair, after a brief closing remark which I should like to make.

MR. MERRIAM'S CLOSING REMARKS

As a young instructor, I was severely sat upon for making a suggestion, which I think I now can make with impunity with the view of more wide experience with engineers.

If I were asked and given permission to say just one word that I should like to impress upon engineers after the experience that I have had, it would be the one word "imagination." I feel that our progress should be through imagination in the sense of forming an image, being able to form the image before us and drive toward that goal.

Perhaps we have leaned too heavily on the word "skill," which is the root of the word "science," and feel that science is what we know. Science is only the things we partly know and it requires imagination to lead us forward.

That is the thought with which I should like

[4] This resolution, like that of the Cartography Division given above, is not a convention resolution of national scope, but rather is a recommendation for certain action by the Board of Direction. For a report of action taken by the Board on this resolution, *see* page 262.

to leave this Congress and welcome President Higbee to the rostrum. President Higbee.

(Applause.)

NEW BUSINESS

PRESIDENT HIGBEE: Thank you very much, Mr. Merriam, for your cordial remarks.

I believe the first order of business is to pass on these resolutions which have been presented from the floor, as to whether you wish to recommend them to the Board of Direction for their action. Do you wish the resolutions reread, do you wish to act on them as you have heard them, do you wish to act on them singly, or do you wish to act upon them as a group?

MEMBER FROM THE FLOOR: Group.

PRESIDENT HIGBEE: All right, do I hear a motion?

MEMBER FROM THE FLOOR: I move they be accepted.

MR. WOOLDRIDGE: I second the motion.

PRESIDENT HIGBEE: All those in favor signify by saying "aye." Contrary minded, "no." The motion is carried.

Is there any other business to come before the meeting?

MR. TROWBRIDGE (of Waterbury, Conn.): I have two items which I would like to put before the meeting. One is about the cumulative roster for our society. According to my research in the journal, I find that the last one was published in the second issue of 1952.

Now, since that time, there have been lists of new members published in, I think, all of the successive issues, but a cumulative roster, a total roster of the society, it seems to me, should be published oftener than once in three years.

Now, one thing I would like to inquire of the Publications Committee, or the editors of the magazine, is whether they have any intention of publishing such a cumulative roster.

I will give you my reasons for it. I hope to create or instigate or propose in Connecticut a chapter or division of this Congress which will compare favorably with others in the United States. I recognize the fact that we are one of the smaller States in the Union but, nevertheless, in order to do any effective work along those lines, my first intent . . would be to review the cumulative roster and make a list of the Connecticut members of the Congress and then canvass them toward the organization of a Connecticut chapter.

PRESIDENT HIGBEE: I think you have a very worthy plan in mind, Mr. Trowbridge, and perhaps Mr. Thompson can comment on what we might hope to get in the way of publications.

MR. THOMPSON: The President and the Board of Direction now have in their possession a recommendation by the Publications Committee that a separate be published within the following year which would contain the complete roster, the names of all officers of the Congress, the names of all Local Section officers, committees, and all vital statistics connected with the Congress.

In addition, we would like to have the Constitution and Bylaws in that same separate. At the present time, you know, the Constitution is in a state of flux and that is what is holding up the publication of the separate at this time. We hope that will be completed by the end of this calendar year.

It is a need that has been expressed by many different individuals. It is a rather expensive proposition to do every year, but we feel that it should be done at least every two or three years and that is now a project which we have before the Publications Committee, and before the Board of Direction on the question of enabling us to proceed with the project.

MR. TROWBRIDGE: Thank you very much, Mr. Thompson. I think a separate roster, as you describe, would be a great deal more valuable than one published in the journal because I believe it would be, so far as my interest goes, a great reference work. I might ask if it would be possible, also, that the roster include the professional connection or the professional status of each member?

MR. THOMPSON: I believe that is the understanding.

MR. TROWBRIDGE: The firms they are connected with or whether they are in private practice or some such item as that?

MR. THOMPSON: I think we have done that in the past; at least, it is our intention to to do it in the future.

MR. TROWBRIDGE: I am a life member of the Connecticut Civil Engineers and we have a membership of 1,200 and our roster is published each year in our yearbook and I have found it very useful in the past and I know a great many other members have.

Thank you for the information about the roster.

MR. THOMPSON: I think we are all agreed on that and I hope that you will see it within a few months.

PRESIDENT HIGBEE: Mr. Dix would like to comment on this roster subject.

MR. DIX: The main trouble with printing a roster every year or so is that so many sur-

veyors in this vast country of ours move as many as six times during a quarterly issue of the journal. It is our experience, sadly enough, that the roster is out of date before it comes back in galley proof. If it were photogrammetrists who worked in an office or something of that nature, it would hold up much better, but with some of our geodetic engineers moving so fast that you can't even keep up with them by first-class mail, the roster is, at its best, not a rigid address index and no one knows more than I because I handle those changes.

It is getting more difficult to keep addresses up to date on a mechanical means of addressing the journal because the Post Office Department itself has so many new rules and regulations and so many new people around and changes of administration, that the old system of address notification has broken down.

In the matter of keeping up with journal addresses, it practically breaks down altogether because the Post Office today only forwards to changed addresses at parcel post rates paid or guaranteed, or returns the journal to us under similar guarantee, or just throws our magazine in the wastebasket and sends the envelope back for a fee, sometimes with a new address on it if party left one, but often not.

All those things make it exceedingly difficult to keep up a good surveyor roster. Getting to the point, though, of your plan of a Connecticut Section, I can almost feel Professor Rice of New Jersey thinking to himself: when I want to do that, I get in touch with Secretary Dix and ask him to strike off a record of the Connecticut members from the mechanical mailing plates, which I do; but I will guarantee you then that ten percent of those will possibly have bad addresses because I can't keep up with them even at the source. But just drop a line and we will send you that Connecticut list when you need it and it will be as fresh as we can make it.

MR. TROWBRIDGE: Thank you very much.

PRESIDENT HIGBEE: I can say "amen" to all that Mr. Dix says about the difficulty of keeping up the mailing list of surveyors who are constantly moving around. I think that even organizations like Engineering News Record will tell you that they have about a 50 percent change of addresses over a year's time.

Now, you had another proposition, Mr. Trowbridge?

MR. TROWBRIDGE: Mr. President, there has been a sentiment expressed in the Property Surveys Division this morning regarding the time during the year for this convention to be held. There is considerable sentiment that we should advise the Board of Direction to consider holding this convention a little later in the month of March. I think our first choice would be the last week in March. I hope that the suggestion may receive consideration, if not bear fruit.

PRESIDENT HIGBEE: Maybe I'm jumping the gun a bit, but, subject to the reappraisal of this convention and approval by the Board of Direction, the hotel has already been engaged for the last week in March.

MR. TROWBRIDGE: Good.

(Applause.)

PRESIDENT HIGBEE: That is about the only time we can get it. Incidentally, that was done a year ago and the only reason the meeting was not held later this year, as I understand it, is that this was the only week which was free for a full week by the hotels. These conventions, as you know, are reserved a long period ahead with the hotels today because there are so many conventions on the road that that is about the only way you can get them in, so that your times are not always the wishes of the organization but, many times, when the organization can get the space in the hotel.

Do you have something more, Mr. Dix?

MR. DIX: You have almost covered it but I would like to mention one little point. You have been at this convention for nearly a week now and just the lack of one little hall for one Division meeting is enough to make it impossible to schedule in a certain week, and we have to have the whole thing cleared through the Board. We practically have to take this whole hotel over and, as President Higbee has said, it is pretty hard to get scheduled. We do the best we can. The month of March has been set up and we generally jump from one end to the other, and Lent is also during the month of March and you have to dodge certain places in there and it is a rough time, but we do the best we can.

PRESIDENT HIGBEE: I might also tell you, in connection with the resolution that you passed relative to a consecutive meeting next year, that I have been advised by the incoming president of ASP that, contingent upon our following the plan, they have approved it and are very much interested and it has the official approval of their Board in going ahead with a consecutive meeting next year.

Is there any other business to come before the meeting?

(No response.)

PRESIDENT'S MESSAGE

PRESIDENT HIGBEE: It seems to be the practice that the incoming President should give you some burning message which will spur you on during the coming year and outline the things which, in his mind, you should devote your time to.

I have tried to make mine a skeleton, leaving the fill-in to your imagination and also to your experience which, in many of the suggestions that I'm making, may be much greater than mine. So, if there is no further business, we will proceed to the President's message, after which we will be in a position to adjourn.

There are some advantages in having a royal family in the administration of governing affairs in that the heir-apparent can go through a considerable seasoning process before succeeding to authority.

Now that I am face to face with the realities of the office of President of ACSM, I begin to realize how inadequate has been my preparation for carrying out its responsibilities. Therefore, let my first recommendation be that more members of ACSM aspire to be President, work on its committees, carry out special assignments, and thoroughly indoctrinate themselves in the purposes and operations of ACSM and thus be prepared to take the presidency in their stride, at the same time keeping in mind the fact that all within the royal family are trained but only one finally achieves the top.

Although I am deeply grateful for your confidence in my leadership and consider this office my greatest civilian honor, I am sincerely regretful of the circumstances which have caused Mr. Merriam to step down from the second term which is rightfully his and for which he is so eminently fitted to continue.

I have been reading over Mr. Merriam's message of last year and I am tempted to copy it verbatim, with proper quotation marks, and offer it as my message. Should I do so, you probably would stop my pay and allowances. There is need to keep some continuity of purpose and effort, hence my references to his message, which I recommend that you look up and reread.

Attention is directed to the revision of the Constitution now in process. Some impatience has been noted for failure to complete this project. Let me quote from Mr. Merriam: "The need now is for a period of calm consideration, rather than immediate ratification. It is obviously better to have an imperfect union that accomplishes something than a more perfect one that might not function as well." We are still in this period of change and I am inclined not to want to reclothe the rapidly growing child immediately but rather to let out the seams as needed for the present.

There are numerous problems being presented to the Congress by its members who seek answers that are definite and positive and which go beyond the bounds of experienced advice. It seems to me that the Congress should be a clearing house rather than a promulgator of do's and don't's. With its limited, unpaid headquarters staff, such a functional conception may become a snowball of unworkable proportions.

It is possible to visualize an extension of regional membership groups or affiliates who are better able to set up standards of procedure peculiarly suited to local conditions, using ACSM headquarters as a collector and clearing house of the experience of others. The current licensing and registration situation is pertinent.

From the panel discussion held on the subject of licensing and registration, the failure of present laws seems to lie, not in the laws themselves, but rather in the lack of proper interpretation and enforcement. Here the ethics of human relationships come into conflict, hence it behooves us as members to govern our own acts in accordance with the ethics of the profession and to lay more stress along this line in the education of the new generation. Example and precept should go hand in hand.

This brings us to the subject of education of the new crop of surveyors coming through our schools and colleges. The curriculum time devoted to surveying has been gradually decreasing during the past 25 years. To my knowledge only a few surveying professors have ever become deans of engineering, and they do not generally achieve master's or doctor's degrees.

More modern engineering courses have encroached upon surveying time, and what remains has become a course in instrumental procedure rather than the needed seasoning for entrance into the field of land surveying. Through alumni, and by that I mean alumni of ACSM, and local groups, alumni of the different schools and colleges also, pressure can be brought to arrest this trend and get it started back toward its former status.

Public relations are as important to us as to any other group. This we practice through our annual meeting, our regional meetings, and the work of the Publications Committee and Editorial Staff. To again quote Mr. Merriam, "SURVEYING AND MAPPING forms the cement in

welding a more perfect union among the members, and to many is the only tangible evidence that the Congress exists."

From my own contact with ACSM members around the country, I know that this link with the Congress is appreciated over and above the dues paid, and that the personal friendships developed through the annual and regional meetings cannot be valued.

The dream of a consecutive meeting is about to become an historical reality. Its success has been beyond the most optimistic estimates. The enthusiasm of numbers has again been evidenced and should give us a greater determination to increase our membership over last year. Is it too much to ask the present membership of over 3,500 to show an increase of 1,500 by March 1956? Suppose we don't let California and Texas do all of the competing. I am hoping that I can visit the regional groups and add my encouragement to your efforts. I am further hoping that there will be additional regional groups seeking indoctrination.

Attention is directed to the term "American" which appears in the name of our Congress. To interpret it in its fullest sense, it includes all of North and South America. The membership outside of the United States has been most gratifying. Both members and visitors from Canada, Mexico, and Central and South America have contributed greatly to the growth and success of ACSM and their continued support and attendance is invited.

We also warmly greet those who have come to us from outside the boundaries of North and South America and look forward to their return.

We should likewise encourage advertisers in our publication and encourage an exhibitors section to be organized, properly officered, and hold at least one meeting during the annual meeting, whereby opportunity can be given for vocal expression by those who contribute so much to the meeting.

Lastly, let us extend our public relations to those outside of the profession, informing them as to the value of surveys and maps in their daily life. I have a whole page of suggestions as to ways in which these maps could be valued. I leave it out here because I think you know more about that than I do.

Let us carry to the world at large the message heralded to the press by ASP that only 5 percent of the world has been adequately mapped, that the peace and economic well-being of the world requires maps, and that the members of the two societies, ASP and ACSM, can make them.

Gentlemen, if there is no further business, I will entertain a motion to adjourn the Fifteenth Annual Meeting of ACSM, and then, to close the consecutive meetings of ASP-ACSM, I have the privilege of introducing the General Coordinator of this meeting who has just been given an Honorary Life Membership, Marshall S. Wright, Sr.

GENERAL COORDINATOR'S MESSAGE

MR. WRIGHT: I think it is only appropriate that Mr. Higbee adjourn the meeting of the American Congress on Surveying and Mapping because it seems to be my function to adjourn both of them.

When I was asked by Mr. Lundahl and Mr. Merriam last spring to accept this position as General Coordinator, I agreed under two circumstances: One, that I have nothing to do; secondly, that I have able assistance. They were very nice and appointed Ray Smart, Chester Kowalczyk, Jim Webb, Helmuth Bay, and Walter Dix.

A few weeks after, I left for Europe. When I got back a few days before Thanksgiving, I found that everything was done. Actually, there was nothing for me to do. I couldn't even get the committee together. If I called them up, they would say, "We are too busy. If you want to know what is going on, we will tell you, but we just can't get together."

Finally, on about the 21st of January, I got everybody together and they briefed me on what had occurred, so I deserve no credit whatsoever. It goes to these people and to about 50 others. We had a meeting the other night, just a roundup, to be sure that everybody knew what their functions were. There were over 50 people there and I want to pay high tribute to them.

In meetings like this one and that of the American Society of Photogrammetry, things run quite smoothly and people don't give much thought to who does it or how it is done, but I want to assure you that these people started work just the next day after the last meeting and they have worked ever since. Committees have been working and they have taken work home weekends. There are people here at this meeting now who took their annual leave for this year to come here and work and they are on leave at the present time.

There might be a misconception that a lot of these people are paid. They are not paid one cent by the American Congress on Survey-

ing and Mapping; they are devoting their time to it and it is purely a labor of love. I think it certainly ought to be appreciated and I know that it is.

I do want to call attention to one or two things that have just come up in the last few minutes. Of course, you heard the President say how many people were registered. I do want to emphasize that this isn't double registration. If they are members of both the American Congress on Surveying and Mapping and the American Society of Photogrammetry, they didn't register twice, and so it indicates that we really have twice as many people here as we ever had before.

I think that is remarkable and I think that it is an indication, as has been said, that these meetings are very popular. I certainly hope that they do go on. Since my role has changed in the last year or so, and I now am a representative for one of the exhibitors, I think I can safely say for all of them that they heartily endorse the idea for economic reasons and because they can exchange back and forth between the photogrammetrists and surveyors their common interest.

The award I received a few minutes ago, as I told you, was a little upsetting. I didn't know anything about it and Walt Dix knows that that is so. I most assuredly didn't and I certainly appreciate it.

I want to call your attention to the fact that the Board of Trade contributed the services of Miss Embrey and other people to us absolutely free; and I also want to call your attention to the fact that Mr. Harding gave his time. He represents the United Nations Honor Flag Committee—you have seen the United Nations flags here and our own flag—and he handled that all absolutely on his own time, at no cost to us whatsoever.

I do also want to call to your attention one particular thing and that is that there is more interest in surveying and mapping than ever before in history. This tremendous interest is due to the emphasis in developing natural resources, urban planning, soil conservation, location of new highways, turnpikes, pipelines, and so on. For example, Arthur Lundahl, President of the American Society of Photogrammetry, in his opening address, said that proposed expenditures during the next few decades on maps and dependent projects are estimated to cost considerably more than 100 billion dollars.

I have no further comments to make. Are there any particular points or anything that anyone wants to contribute before we adjourn both meetings?

PRESIDENT HIGBEE: Mr. Chairman, it seems to me that, subject to the approval of the Resolutions Committee, we should offer a suitable expression of our appreciation to all of those who have given their time so freely, and by that I mean everybody from the top right on down.

MR. MERRIAM: I know that will be acceptable because in our meeting today, mention was made of supplementing these resolutions with the usual courtesy resolutions and that will be very agreeable. I don't believe any action is necessary. We will ask you to draft it and present it.

MR. WRIGHT: Are there any other comments? If not, we will adjourn until March of 1956.

(Thereupon the 1955 ASP-ACSM Consecutive Meetings were adjourned at 5:30 p.m., Friday, March 11, 1955.)

Action of the Board of Direction on Resolutions Presented at Annual Meeting

(EDITOR'S NOTE.—The following is a brief summary of action taken by the Board of Direction at its meeting which immediately followed the close of the Annual Business Meeting on March 11, 1955, with regard to the six resolutions which were presented at the business meeting. Inasmuch as the texts of the resolutions are given in the report of the business meeting which immediately precedes and inasmuch as the wordings of these has been approved by the Board, the resolutions are identified here only by descriptive title. It will be noted that the sequence of resolutions as given below does not correspond with the sequence in which they were given at the business meeting, but represents, rather, the order of consideration by the Board.)

Resolution 1: ACSM Cartography Division recommendation to ACSM Board to establish paid position for Editor-in-Chief.—This resolution was deemed by the Board to be an intra-ACSM matter rather than a national or public

resolution having annual convention status. It was referred to committee for study and recommendation.

Resolution 2: Appreciation to the Commissioner of Public Roads and the American Association of State Highway Officials for their support and cooperation in ACSM resolutions from the Fourteenth Annual Meeting.—The resolution was adopted by the Board.

Resolution 3: Resolution addressed to the Executive Branch of the Federal Government, various State highway departments, and others toward enactment of laws providing for survey ties to connect the surveys of engineering and construction of the National System of Interstate Highways to the national network of ground control.—Resolution 3 was adopted by the Board.

Resolution 4: Request for adequate monumented surveys to connect interstate highway systems to the national network of ground survey control in interest of economy and extended public use.—This resolution, approved in principle by the Board, was referred to committee for clarifying rewrite to prevent misunderstanding. Approval by the committee was to be final without further board action. The committee has since completed its rewrite; the resolution as presented in the preceding report represents the rewritten and approved resolution.

Resolution 5: Encouragement of survey education toward professional ability rather than techniques.—This resolution was approved in principle and adopted conditionally, but was returned to the Education Division with encouragement and with a request for a plan of action.

Resolution 6: Recommendation from Technical Division Chairmen urging that ACSM Board give immediate consideration to negotiations with ASP for continued consecutive meetings arrangements in 1956 after advantages and disadvantages have been appraised.—This resolution, like Resolution 1, above, is a "meeting resolution" rather than an ACSM convention resolution. While discussion indicated the Board to be generally in favor of holding consecutive meetings and co-exhibit with ASP in 1956, it was deemed wise to delay action until full reports of the 1955 venture could be studied. Accordingly, the Board voted to file the resolution for reference by officers and committees, and to refer the matter of the next annual meeting to the Executive Committee with power to act.

Southern California Section Has Money in the Bank

The Southern California Section, under the able leadership of Charles R. Herr, finished the past year in a very healthy condition, and with General Petroleum's William C. Meek as the new Chairman, it has every reason to expect more of the same. Money in the bank—well over two hundred dollars—and an active local membership of 139 paid-up members is *real* healthy in these parts.

Bill Meek has plenty of help for the current year in the following list of officers and committeemen. Of course, hidden, unexpected vices and old age might slow a few down, but, judging from the work and planning accomplished this first month, such fears aren't too likely to materialize.

Don P. Jones, a surveyor and the man in the middle of Pafford, Jones & White, of Los Angeles, is the Vice-Chairman.

Selwyn Douglas, Secretary, is another oil man, and having his own secretary made him a natural for this job.

Alfred H. Boysen, being a City Engineering Department Head and not used to getting or spending money, seemed to fit as a Treasurer dedicated to building up the fund turned over to him.

Directors John E. Asher, George A. Greenewald, Jr., Robert B. Irwin, and Charlie Herr should be competent to advise and uphold the above officers.

Shell Oil's George L. Baker is the Membership Committee Chairman; Roy M. Sylar, of the USC&GS, is the Mapping Chairman, Leighton Keeling, of Surveyors Service Co., has the tough job of Program Chairman. His outline for the coming year looks good—on paper, at least—with five affairs planned, including the joint weekend get-together with the Northern California Section, held in Fresno, May 6, 7, and 8.

We think 1955 will be a big year for us here in God's Country—the southwest corner of it, that is.

—Tom R. Humes
Section Editor

Northern California Section

Meetings of the Northern California Section were held on April 22 and 23, 1955, at Salinas and San Jose, California, with the same program presented at both meetings. C. A. Wooldridge, Jr., Chairman of the Section, outlined the history, aims, and purposes of ACSM and the Northern California Section.

F. H. Moffitt, professor of civil engineering at the University of California, and C. J. Aggeler, instructor of surveying at San Francisco City College, discussed the California Coordinate System. Special emphasis was given the uses and advantages of the system which is employed by many Federal and State agencies including State highway agencies on new construction. Land surveyors license examinations as well as some civil service exams now include questions about the system.

A dinner preceded the meeting in Salinas and a lunch was held prior to the San Jose meeting.

The Northern California Section also met on April 15 at the Friden Calculating Machine Company plant in San Leandro, California. The meeting included a tour of the Friden plant which afforded an opportunity to see the parts that make up a computing machine. Short cuts in computation methods were demonstrated and machines were made available for close inspection. Following the tour, members of the Section were guests of the Friden Company at dinner.

A joint meeting of the Southern and Northern California Sections was held May 6, 7 and 8, 1955, in Fresno. "Applications of the California Coordinate System" was the subject of a panel discussion. Papers and discussions were also given on boundary surveys, titles, descriptions, and glass, plastic, and negative scribing.

—H. A. WATERFALL
Secretary

Colorado Section

The Colorado Section held its first meeting of the year on February 21, 1955, with 33 members in attendance.

The meeting featured two technical papers and a report on legislative changes of interest to engineers and surveyors.

Bennett L. Boggess, in his paper entitled "Verticality of Structures," described methods now in use to maintain walls of structures in a vertical plane. Mr. Boggess enlivened his talk with amusing and informative incidents which occurred during the recent erection of a building in Denver.

An interesting paper on "Triangulation in New Mexico" was given by Harold J. Welch in which he gave a narrative account of work he performed in establishing basic control for use in land subdivision in that State. Mr. Welch also showed a film on adjustments of the Kern theodolite.

K. A. Heron discussed recent legislative changes concerning licensing of engineers and surveyors.

Forty-five members and guests attended the next meeting, on March 21.

This meeting featured a talk on electronic computing machines given by Stone Wipprecht, sales representative of Remington Rand Inc. Mr. Wipprecht described the basic principles of Univac and outlined the requirements a modern computing machine must meet in order to satisfy the demands of modern business. The talk was illustrated with a film entitled "Univac" which dealt with the construction of the machine, its operation, and its various uses. After the talk Mr. Wipprecht answered questions from the floor regarding assembly of data to be used in the machine, availability of the computer, and its cost.

—M. H. ZALEWSKI
Section Editor

Ohio Society Honors Sol A. Bauer

The following is quoted from *The Ohio Engineer* for March 1955:

A past president of the Cleveland chapter and a member of its Board of Trustees for 16 years is this year's recipient of the Ohio Society of Professional Engineers Award and Citation. A nationally-recognized engineer and surveyor, Sol A.

Bauer has been in private surveying practice since 1925 and today is abreast of all evolution in the surveying and mapping field.

Mr. Bauer, a graduate of Case Institute of Technology, took an early interest in Society affairs. His interest and efforts did not cease or wane following the termination of his Board membership in 1951. He has continued to serve on committee activities and is currently serving on the OSPE Professional Practices Committee.

He is a strong advocate of the use of both the horizontal and vertical control of the Cleveland Regional Geodetic Survey in everyday survey operations. He has run many miles of traverse and has experimented with many field operations in transit and taping procedures to arrive at a series of recommendations for certain standards of field accuracy.

Mr. Bauer was president of the American Congress on Surveying and Mapping in 1950. This is an elected office which points out the esteem and confidence shown for him by members of this national organization. He is currently serving the Congress as chairman of its Professional Status Committee and also as chairman of the Handbook Committee of its Property Surveys Division.

He has fulfilled a five-year term on the executive committee of the Surveying and Mapping Division of the American Society of Civil Engineers and served as chairman in 1952, his last year on the committee.

In addition to being the author of many articles in technical journals, Mr. Bauer was chairman of a national committee which developed the "Technical Standards for Property Surveys," a pamphlet officially adopted by the American Congress on Surveying and Mapping and distributed widely in this country and abroad. He was also chairman of another national committee which developed the pamphlet "Equitable Fees for Property Surveys," which has also had wide circulation by the Congress.

Coupled with Mr. Bauer's attributes as a surveyor and engineer are such personal qualities as modesty, sincerity, friendliness, cooperativeness, and pleasing personality. Other than being a top-ranking surveyor, he is a master of fine arts in the field of sculpture. Mr. Bauer has exhibited in competitions in Cleveland, New York, Philadelphia, and other cities and has won many prizes. His work has been purchased by the Cleveland Museum of Art and the Pennsylvania Academy of the Fine Arts. Likewise, for many years he has served on the Fine Arts Advisory Committee of the Cleveland Planning Committee, assisting in the judging of aesthetics of structures built upon city property.

The Ohio Society of Professional Engineers takes great pleasure in bestowing honor on Sol Bauer for his contributions in establishing the high standards enjoyed in Ohio in surveying and engineering.

The text of the citation is as follows:

"The Ohio Society of Professional Engineers presents to Sol A. Bauer, eminent Surveyor and Engineer, this Citation and Award in recognition of his achievements, particularly in the field of property surveying, his adherence to high standards of practice and ethics in his technical and professional activities, his authorship of many papers, his local, state, and national prominence, his unsullied leadership in the surveying and mapping fraternity, and his modest approach but eager willingness to befriend his brother engineers. Authorized by the Board of Trustees on January the seventh and bestowed in Convention assembled on March the twenty-sixth, nineteen hundred and fifty-five."

Personals

Dr. Talbert Abrams, president of Abrams Aerial Survey and Abrams Instrument Corporations of Lansing, Mich., and a past director of ACSM, was given a Michigan State College Centennial Award on February 12, "in recognition of distinguished services which have contributed to the benefit of mankind."

The award and citation were presented by Dr. John A. Hannah, president of the institution on the occasion of Michigan State College's 100th anniversary, in company with leaders in the fields of the arts, education, and industry of the nation.

Specifically the citation read: "Manufacturer, explorer, and businessman, your company, founded and developed by you in the finest tradition of American enterprise, has made the City of Lansing and State of Michigan known the world over. By your efforts and through your skill, man has looked more clearly on the face of the earth and has discovered more of its secrets. In recognition of your contributions to geographic science, to industry, and to optics, Michigan State College presents to you its Centennial Award."

Col. John G. Ladd, who retired as Commanding Officer of the Army Map Service on May 1, 1955, has been appointed Executive Secretary of the Association of Professional Photogrammetrists. The offices of the Association are at 17 DuPont Circle, NW., Washington, D. C. Col. J. D. Abell is the new Commanding Officer at the Army Map Service.

Annual Financial Statement

(As of December 31, 1954)

INCOME

Dues and memberships received ...	*1953*	*1954*	*Year ending 12/31/53*	*Year ending 12/31/54*	*Differences*
Individual	2,902	3,248	$14,722.41	$16,357.01	+$1,634.60
Library	238	266	1,063.50	1,198.00	+ 134.50
Sustaining	12	21	325.00	620.00	+ 295.00
Previous year's dues			219.00	248.00	+ 29.00
Total	3,152	3,535			
Total gross regular income			$16,329.91	$18,423.01	+$2,093.10
Deduct membership costs			*– 1,699.50*	*– 1,433.35*	+ 266.15
Net regular income			14,630.41	16,989.66	+ 2,359.25
Publication sales			294.17	404.94	+ 110.77
Advertising profit			1,887.32	2,908.66	+ 1,021.34
Annual meeting and other income			250.99	3,223.07	+ 2,972.08
OPERATING INCOME			$17,062.89	$23,526.33	+$6,463.44

EXPENDITURES

Journal (all expenses)			$12,854.08	$13,628.69	+$ 774.61
Other printing			41.90	0.00	– *41.90*
Office supplies and Secretary's and Treasurer's expenses			773.30	1,117.98	+ 344.68
Technical Divisions			75.55	76.89	+ 1.34
Other expenditures authorized by the Board of Direction			221.46	112.22	– *109.24*
TOTAL EXPENDITURES			$13,966.29	$14,935.78	+$ 969.49
PROFIT			**$ 3,096.60**	**$ 8,590.55**	**+$5,493.95**

ASSETS

Bank balance	$ 2,301.80	$ 749.13	*–$1,552.67*
Bonds and savings account	15,055.00	23,831.43	+ 8,776.43
Journal (back issues—estimated)	300.00	300.00	0.00
Advance payments	1,368.85	3.95	– *1,364.90*
Accounts receivable	186.50	1,182.54	+ 996.04
TOTAL ASSETS	$19,212.15	$26,067.05	+$6,854.90

LIABILITIES AND NET WORTH

Advance dues paid	$ 998.80	$ 1,563.15	+$ 564.35
Exhibit space	2,300.00	0.00	– *2,300.00*
Other accounts payable	0.00	0.00	0.00
TOTAL LIABILITIES	$ 3,298.80	$ 1,563.15	*–$1,735.65*
NET WORTH	**$15,913.35**	**$24,503.90**	**+$8,590.55**

JOHN M. AMSTADT, *Chairman*
Budget and Finance

NEW MEMBERS

INDIVIDUAL MEMBERSHIPS

ALLBRIGHT, Capt. William J., Mapping and Intelligence Branch, Engineer Division Headquarters, USAREUR, APO 403, c/o P. M., New York, N. Y.
ALLEN, John H., 165 Turk St., San Francisco 2, Calif.—Cartographic Aid, Corps of Engineers, USA
ANAYA, Marvin, 10890 San Pablo Ave., El Cerrito, Calif.—City Engineer, City of El Cerrito
ANDERSON, Charles M., 424 Old Court House St., Boston, Mass.—Engineer for The Land Court of Massachusetts
ANDERSON, Dean M., Court House, Brainerd, Minn. —Land Surveyor and Civil Engineer
ANTALOVICH, John, 115 Shields St., Rochester, Pa.—Photogrammetric Engineer, Michael Baker, Jr., Inc.
ANTILLA, Reynold, U. S. Geological Survey, Bldg. 25, Federal Center, Denver, Colo.—Cartographer
ASHER, Jack, 721 Fremont St., Las Vegas, Nev.—Civil Engineer and Land Surveyor

BABCOCK, Prof. Henry A., Civil Engineering Dept, Colorado School of Mines, Golden, Colo.
BAKER, Raymond J., Route 1, Crawford, Tex.—Surveyor, Party Chief
BALLINGER, Richard C, 45144 N. Elm Ave., Lancaster, Calif.—Land Surveyor
BARRIE, J. K., c/o Survey Dept., Fullerton Bldg., Singapore, Malaya
BARTHOLOMEW, Raymond L., 137 W. Broad St., Millville, N. J.—City Engineer, Vineland, N. J.
BARTLETT, Philip A., 1123 Oak Hill Rd., Lafayette, Calif.—Assistant to City Engineer, Walnut Creek, Calif.
BAYSINGER, Edgar L, 7 Nolan Drive, Glendale 22, Mo.—Cartographer, Aeronautical Chart and Information Center
BOESCH, Wm. E., 142 Chartres St., New Orleans, La.—Cartographer and Proprietor, New Orleans Map Co.
BOND, Ike B., 1309 Sacramento St., Vallejo, Calif.—Civil Engineer and Land Surveyor
BRANCH, Clyde O., P. O. Box 1107, Shreveport, La. —Chief Draftsman, Interstate Oil Pipeline Co.
BROWN, Harlan, 429 N. 10th St., Las Vegas, Nev.—Consulting Engineer
BRUESTLE, John H., 6 Rutgers St., Maplewood, N. J.—Surveyor, Morris County Engineering Co.
BUENGER, Charles M., Box 1066, Angleton, Tex.—Civil Engineer and Land Surveyor, William C. Walsh and Co.

CALDWELL, James S., 94 Fifth Ave., New Rochelle, N. Y.—Assistant City Engineer
CHEWNING, Melvin E., 2614 Lee Highway, Arlington, Va.—Surveyor, Party Chief
CLARK, Kenneth, Route 1, Box 123, E. Norris Rd., Bakersfield, Calif.—Student
CLARKE, Waldo J., 53 State Highway, Franklin, N. J.—Professional Engineer and Land Surveyor
CLARY, Ernest H., 929 Essex Drive, West, Las Vegas, Nev.—Consulting Engineer and Geologist
CLEAVER, Samuel E., U. S. Geological Survey, Federal Center, Denver, Colo.—Cartographer
CLEMENTS, John V., U. S. Geological Survey, Bldg. 25, Federal Center, Denver, Colo.—Cartographer
COLCORD, Prof. J. E., 201 More Hall, University of Washington, Seattle 5, Wash.—Assistant Professor of Civil Engineering
COLLINS, Tom, County Surveyor, Courthouse, Tulsa, Okla.
CRANDALL, Clifford J., 1085 Lindsay Lane, Florissant, Mo.—Asst. Chief, Topographic Section, Aeronautical Chart and Information Center
CROSS, Earl Ray, 62 Arnold Ave., San Francisco 10, Calif.—Student, City College of San Francisco
CROY, Ralph L., P. O. Box 749, Winters, Calif.—Surveyor, U. S. Bureau of Reclamation
CURTISS, Foster S., 501 Collins St., Plymouth, Wis. —Surveyor

DAVIDSON, David M., 25 E. Philadelphia St., York, Pa.—Vice President, C. S. Davidson, Inc., Civil Engineers
DAVIS, J. H., 314 School St., Houma, La.—Owner, Davis Aerial Photographic Service
DAVIS, Marvin L., 79 Rose Blvd., North, Akron 2, Ohio—Project Manager, Associated Professional Engineers
DEAL, Kenneth E., Box 626, New Orleans, La.—Associate Civil Engineer, Humble Oil and Refining Co.
DeLEON, Dan E., 5203 N. Rampart St., New Orleans, La.—Hydraulic Engineer, Corps of Engineers, USA
DONOHUE, Jos. J., City Hall, Aurora, Colo.—City Engineer
DORSEY, R. E., 7595 W. 47th Ave., Wheatridge, Colo.—Supervisor, Base Sheet Section, U. S. Geological Survey
DUFF, John B., Box 763, Folsom, Calif.—Land Surveyor
DUNLAP, James E., P. O. Box 861, Sonora, Calif.—Land Surveyor

EDWARDS, Lincoln H., 210 Morris St., Morristown, N. J.—Manager and Chief of Party, Robert C. Edwards Assoc., Inc.
EHRICH, William D., U. S. Geological Survey, Federal Center, Denver, Colo.—Cartographer.
ELKIN, David L., 344 Candlestick Rd., San Francisco 24, Calif.

FALK, Koman, 47 Godon St., Tel Aviv, Israel
FANT, Prof. Jesse E., 123 Main Engineering Bldg., University of Minnesota, Minneapolis 14, Minn.—Asst. Prof. of Civil Engineering
FEDER, Louis A., 232 N. Juniper St., Philadelphia 7, Pa.—President, C. S. Wertsner Co., Hand Mounting
FENSTERMAKER, C. Howard, 317 Allen St., New Iberia, La.—Civil Engineer
FLEISCHMANN, Vail, 236 E. Courtland St., Philadelphia 20, Pa.—Field Surveyor, Aero Service Corp.
FOSS, Frank A., 84 Osborne St., Keyport, N. J.—Civil Engineer and Land Surveyor

GANAHL, Lester W., 2300 Yarrow St., Lakewood, Colo.—Photogrammetric Engineer, U. S. Geological Survey
GARROW, John H. P., 113 Brooklea Drive, Syracuse 7, N. Y.—Designer, Engineering Dept., Niagara Mohawk Power Corp.
GARY, George E., 1300 Perris Hill Rd., San Bernardino, Calif.—Highway Engineer, State of California
GENTRY, W. O., 520 Rowell Bldg., Fresno 1, Calif. —Surveyor with J. A. Ross, Surveyor and Engineer
GIOVANNINI, Ector, 25 Eldridge St., Manchester, Conn.
GLASER, Floyd E., P. O. Box 86, Atascadero, Calif. —Asst. Highway Engineer, State of California
GOLDSMITH, Prof. Leo Jean, 3024 S. Elm St., Denver, Colo.—Asst. Professor, Civil Engineering, University of Denver
GOULETTE, J. D., Jr., P. O. Box 1909, Las Vegas, Nev.—Consulting Engineer

HAIGHT, John E., 1043 Johnson St., Fairfield, Calif. —Surveyor
HAMBER, Frederick C., 1127 44th Rd., Long Island City 1, N. Y.—Asst. Treasurer, Fennel Instrument Corp. of America
HANSEN, Alton K., 1100 Daniel St., Kenner, La.—Engineer, U. S. Coast and Geodetic Survey
HARDEN, Bruce J., 2950 S. Adams St., Denver 10, Colo.—Land Surveyor, Prouty Bros. Engineering Co.
HARMALA, Seppo, Katajanokankatu 7-B-15, Helsinki, Finland
HARMAN, John W., Jr., 5125 N. Kenmore St., Chicago, Ill.—Civil Engineer, Joseph K. Knoerle and Associates, Inc.
HARPER, John B., Route 1, Healdsburg, Calif.—Land Surveyor
HARRINGTON, C. M., 920 Humboldt St., Santa Rosa, Calif.—Deputy County Surveyor, Sonoma County
HARTMAN, Herbert, 408 Summit Ave., Jersey City, N. J.——Partner, Clarke and Hartman, Professional Engineers and Land Surveyors
HASELTINE, Raymond H., 2325 N. 11th St., Arlington, Va.—Cartographer, U. S. Coast and Geodetic Survey

HEMPHILL, O. L., 2500 W. 14th St., Little Rock, Ark.—Civil Engineer
HICKMAN, Mark L., 3076 W. 35th Ave., Denver 11, Colo.—Cartographic Technician, U. S. Geological Survey
HILTON, Butler, Box 931, Pinedale, Wyo—Project Engineer, Wyoming Highway Dept.
HOLMES, A. Ray, 128 E. Borden Ave., Syracuse 5, N. Y.—Civil Engineer and Surveyor
HOPKINS, Charles A., 415 E. Orange St., Littleton, Colo.—Consulting Engineer and Surveyor
ROPKINS, Lloyd, Route 1, Box 124, Centralia, Ill. —Surveyor, Shell Oil Co.
HUGHES, L. G., 1135 Sunset Ave., Santa Rosa, Calif.—Division Surveyor, Pacific Gas and Electric Co.

JENNELLE, Ernest M., Route 2, Cambria, Va.—Land Surveyor
JENNINGS, Jack G., 902 22nd Place, Vero Beach, Fla.—Manager, R. D. Carter, Engineering Firm
JODAITIS, Ladislaus T., 56 Norman St., Milton 87, Mass.—Consulting Engineer
JOHNSON, Robert S., 49 Prospect St., Foxborough, Mass.—Land Surveyor
JOHNSTON, James A., 250 Park Ave., Nutley, N. J. —Chief of Party, John I. Blauvelt, Inc.
JOOS, Carl J., 525 W. 33rd St., New York 1, N. Y.
JUEY, Harold L., 551 Tibet Rd., Columbus 2, Ohio—Graduate Student, Ohio State University

KAHLES, M. J., 2112 W. Roscoe St., Chicago, Ill.—Owner, M. J. Kahles and Co., Surveyors and Engineers
KAIL, PHILIP B., 1601 Eliot St., Denver, Colo.—Owner, Philip B. Kail, Associates
KARLINER, Vince, 239 West "C," Brawley, Calif.—Chief of Party for W. D. Hargus
KEATES, John S., Penguin Books, Ltd., Harmondsworth, Middlesex, England
KELLEY, Stanley W., Treasurer, Village of Bloomington, 10200 Penn Ave., South, Bloomington, Minn.
KELLY, Prof. T. A., Civil Engineering Dept., Colorado School of Mines, Golden, Colo.
KELSON, Theodore L., 1130 E. Palmetto St., Lakeland, Fla.—Field Engineer, Davison Chemical Co., Bartow, Fla.
KING, H. Thorn, Old Dublin Road, Hancock, N. H.—Land Surveyor
KINGSLEY, Robert H., 1221 Lynchester Lane, Kirkwood 22, Mo.—Cartographer, Technical Adviser, ACIC
KLIMSCH AND CO., Frankfurt am Main (1), Germany
KNECHT, Andrew H., 1114 Reisterstown Rd., Pikesville 8, Md.—Partner, R. Brooke, Maxwell and Associates
KOENIG, Eugene H., 518 S. Forest Drive, West Englewood, N. J.—Dept. Head, Keuffel and Esser Co.
KOHLER, C. A., 2421 Liberty Ave., Beaumont, Tex. —Consulting Engineer
KORDZIEL, Andrew J., U. S. Geological Survey, Bldg. 25, Federal Center, Denver, Colo.—Cartographer
KREISMAN, Arnold J., 210 E. Luray St., Philadelphia 20, Pa.—Cartographer, Relief Model Div., Aero Service Corp.
KULHAN, Prof. Edward F., 1117 Oneida St., State College, Pa.—Instructor, Civil Engineering Dept., Pennsylvania State University

LACY, Milo S., 1555 Lafayette St., Santa Clara, Calif.—Civil Engineer, Partner, Mission Engineers
LA FAVE, Aziel, 310 Watertown National Bank, Watertown, N. Y.—Land Surveyor
LEWIS, Frank B., Court House Annex, Santa Cruz, Calif.—County Surveyor
LOUNSBURY, Hewitt V., 1328 11th Ave., Anchorage, Alaska—Surveyor
LUNDAHL, Arthur C., 4401 Chestnut St., Bethesda 14, Md.—Adviser to Director of Naval Photography

McDOUGALL, David R., 106 E. Prospect St., Hawthorne, N. J.—Draftsman-Computer, Canger Engineering Co.
McENTYRE, Prof. John G., Civil Engineering Dept., Kansas State College, Manhattan, Kans.
McKEE, Leo K., Court House, Freehold, N. J.—County Engineer, Monmouth County
MEAD, Arthur F., Jr., c/o Ahlers Engineers, Vail Rd., Parsippany, N. J.—Surveyor, Chief of Party
MEGSON, Harry K., Foote Rd., South Glastonbury, Conn.—Civil Engineer, Conn. Light and Power Co.
MILLEN, Mrs. Mabel G. B., 28 Edwin Place, Pompton Lakes, N. J.—Secretary-Treasurer and General Manager, Frederick H. Millen, Associates
MITCHELL, James S., Box 197 (T & C), Sacramento 21, Calif.—Cartographer, U. S. Geological Survey
MOELLER, Glenn E., Box 64, Woodland, Calif.—Partner, Yolo Engineers and Surveyors, Associated
MORRIS, Richard E., 921½ Lincolnway St., LaPorte, Ind.—Civil Engineer, Morris Engineering Co.
MYERS, R. C., Film Department, Industrial Sales, duPont Co., Wilmington, Del.

NOBLE, Charles M., Cherry Valley Rd., R. D. 2, Princeton, N. J.—Chief Engineer, New Jersey Turnpike Authority
NOFTZGER, Richard L., 6417 Melrose Lane, Shawnee, Kans.—Chief of Party, James L. Bell and Co., Surveyors and Engineers

O'CONNOR, Desmond, School of Civil Engineering, New South Wales University of Technology, Broadway, Sydney, NSW, Australia—Lecturer in Civil Engineering
OLIVER, H. R., 1504 Broad St., Camden, S. C.—Forester and Surveyor
ORTON, T. G., 3220 Lamar St., Little Rock, Ark.—Senior Designer, Arkansas Highway Dept.

PARSONS, E. D., Jr., c/o S. P. Chapman, P. O. Box 193, New Orleans, La.—Junior Surveyor, Shell Oil Co.
PARVIN, Jack, Box 152, Las Vegas, Nev.—Highway Engineer and Land Surveyor
PASSARINO, Herbert G., 908 Franquette Ave., Santa Rosa, Calif.—Land Surveyor
PATERSON, A. J., 1170 Robson St., Vancouver B. C., Canada—Manager, Frederick Goertz, Ltd.
PEET, Olmstead, 70 S. Main St., Pittsford, N. Y.—Draftsman, The Halold Co.
PENNINGTON, Dearyl E., Geophysical Service, Inc., 5900 Lemmon Ave., Dallas, Tex.—Survey Party Chief
PERRY, Gilbert F., 15 Providence St., Putnam, Conn. —City Engineer
PETERS, Stanley B., 101 Clifton Ave., Lakewood, N. J.—Civil Engineer and Land Surveyor
PETERSON, Daniel K., U. S. Geological Survey, Bldg. 25, Federal Center, Denver 14, Colo.—Cartographic Compilation Aid
PINCHBACK, R. T., Jr., P. O. Box 411, Anahuac, Tex.—County Engineer, Chambers County
PLATT, Geo. Albert, 125 Horner St., Toms River, N. J.—Engineer and Land Surveyor
PRATZ, Calvin H., Box 7600, Chicago 80, Ill.—Mgr., Cartographic Production Dept., Rand McNally & Co.
PRESSEY, Raymond C., 113 Munroe St., Lynn, Mass.—Raymond C. Pressey, Inc., Engineers and Surveyors

RICHARDSON, James E., Box 281, West Branch, Mich.—Project Engineer and Superintendent, Ogemaw County Road Commission
RICHTER, Horace F., 444 S. 43rd St., Philadelphia, Pa.—Consulting Engineer
ROBINSON, M. W., 712 Leroy Ave., London, Ontario, Canada—Regional Surveyor, Dept. of Highways, Ontario
ROMIG, John C., P. O. Box 626, New Orleans, La.—Draftsman, Humble Oil and Refining Co.
RUIZ SOSA, Milton W., 214 Las Caobas, Rio Piedras, Puerto Rico—Civil Engineer and Contractor

SABIN, Richard D., P. O. Box 197 (T & C), Sacramento, Calif.—Cartographer, U. S. Geological Survey
SARGENT, Loren J., 2046 Canal Drive, Redding, Calif.—Surveyor, Shasta Forests Co.
SCHELL, Leo H., 1226 Warner Court, Lafayette, Calif.—Land Surveyor
SCHOFIELD, James E., Eastham, Cape Cod, Mass.—with Schofield Brothers, Civil Engineers and Land Surveyors
SCHWAFEL, Edward P., 1417-C Georgia St., Vallejo, Calif.—Civil Engineer
SCOTT, George D., 2425 Robin Drive, Apt. 4, Colorado Springs, Colo.

SEPPELIN, Thomas O., 8321 14th Ave., Hyattsville, Md.—Cartographic Analyst, Aeronautical Chart and Information Center
SESSUMS, Francis B., General Delivery, Lafayette, La.—Assistant District Engineer, Louisiana State Dept. of Public Works
SHIELDS, J. L., 294 Boardman St., Auburn, Calif.
SILVAGIO, Peter M., c/o Niagara Mohawk Power Corp., Syracuse 2, N. Y.—Superintendent of Survey
SMITH, Waldo G., 3821 W. 25th Ave., Denver, Colo.—Cartographer, U. S. Geological Survey
SNYDER, Mike, P. O. Box 387, Long Beach, Wash.—Resident Engineer, Washington State Highway Dept.
SOLFIELD, Ralph R., 6327 16th Ave., South, Minneapolis 23, Minn.—Surveyor, C. E. Coulter, Land Surveyors
SOULE, Kenneth E., 1638 Huntoon St., Oroville, Calif.—Land Surveyor
SPARKS, R. G., City Hall, Houston, Tex.—Abstractor, City of Houston
STEPHANSKY, J. D., 1131 Riley St., Lansing 10, Mich.—Asst. Chief, Lands Division, Michigan Dept. of Conservation
SUNDERLAND, Clyde, Municipal Airport, Oakland, Calif.—Owner, Aerial Surveys Company
SVOBODA, Lawrence, 6414 Renwood Drive, Parma 29, Ohio—Surveyor, National Survey Service, Inc.
SWENSON, Paul B., 8312 14th Ave., Hyattsville, Md.—Cartographer, USAFACIC

TARBELL, Russell L., 267 Milk St., Fitchburg, Mass.—Highway Engineer, Massachusetts Dept. of Public Works
THACHER, Elwood J., 128 N. Wakefield St., Arlington 3, Va.—Cartographer, Topographic and Photogrammetric, U. S. Geological Survey
THOMPSON, Charles L., 720 E. 38th St., Indianapolis, Ind.—Civil Engineer, Clyde E. Williams and Associates
THORN, H. Clifford, Jr., 715 N. Cedar Drive, Covina, Calif.—Field Supervisor, J. F. Tuttle Engineering Co.
TRAMMEL, Glenn, 3318 W. 10th St., Little Rock, Ark.—Senior Designer, Plans Section, Arkansas Highway Dept.
TRUSSELL, L. Weems, Box 688, Fordyce, Ark.—Attorney at Law
TYTULA, John B., 801 Pound Bldg., Chattanooga, Tenn.—Civil Engineer, TVA

VALENTINE, Elmer F., 1318 Lincoln Ave., Walnut Creek, Calif.—Surveyor
VANCE, Richard J., 522½ Santa Clara St., Fillmore, Calif.—Chief of Surveying Party, Walsh Engineering Co.
WHITE, Albert C., Asst. Director of Public Works, City Hall, Richmond, Calif.
WILLIAMS, N. T., 449 Shannon St., Schenectady, N. Y.—Asst. Division Agent, Delaware and Hudson Railroad
WILSON, Embree D, 315 S. 15th St., Las Vegas, Nev.—Civil Engineer, Southern Nevada Power Co.
WOJCIKOWSKI, Eugene T., Elmcrest Rd., Liverpool, N. Y.
WOLHEIM, Charles M., 521½ N. Alfred St., Los Angeles 48, Calif.
WOOD, C. B., Angola, Ind.—Land Surveyor
WOOLDRIDGE, Charles A., 434 13th St., San Bernardino, Calif.—Civil Engineer, State Division of Highways
WRIGHT, John U., 420 E. First St., Port Angeles, Wash.—Civil Engineer and Land Surveyor

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CHICO STATE COLLEGE, Chico, Calif.
DETACHMENT 1, 1370th P M GP, Orlando Air Force Base, Orlando, Fla.
ECOLE POLYTECHNIQUE, 1430 rue Saint-Denis, Montreal 18, Canada
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Missing: Three Historic Washington Cornerstones

CORNERSTONES may weigh several tons but sometimes are lost as easily as a dime.

In the wake of a hunt for New York City Hall's cornerstone, Federal authorities sought information on the whereabouts of the cornerstones of the White House, United States Treasury, and the Washington Monument, but were unable to locate any of them.

The cornerstone of the Washington Monument is known to contain many mementos, among them copies of the Constitution and the Declaration of Independence, Washington's portrait and coat of arms, a copy of *Godey's Lady's Book* (a volume of fashion displays), and several newspapers. This stone is believed to be somewhere in the northeast corner, probably hidden by subsequent foundation enlargement.

The cornerstone of the Treasury, into which President Jackson had sealed a lock of hair from his granddaughter's head, likewise cannot be found in the granite building erected in stages since 1836.

During the recent renovation of the White House, mine detectors were used in an attempt to find a metal plaque indicating the cornerstone location. In the southwest corner, where the stone supposedly was laid in 1792, the detectors indicated a sizable metal object—perhaps the plaque—but the wall was not entered.—*National Geographic News Bulletin*, April 15, 1955.

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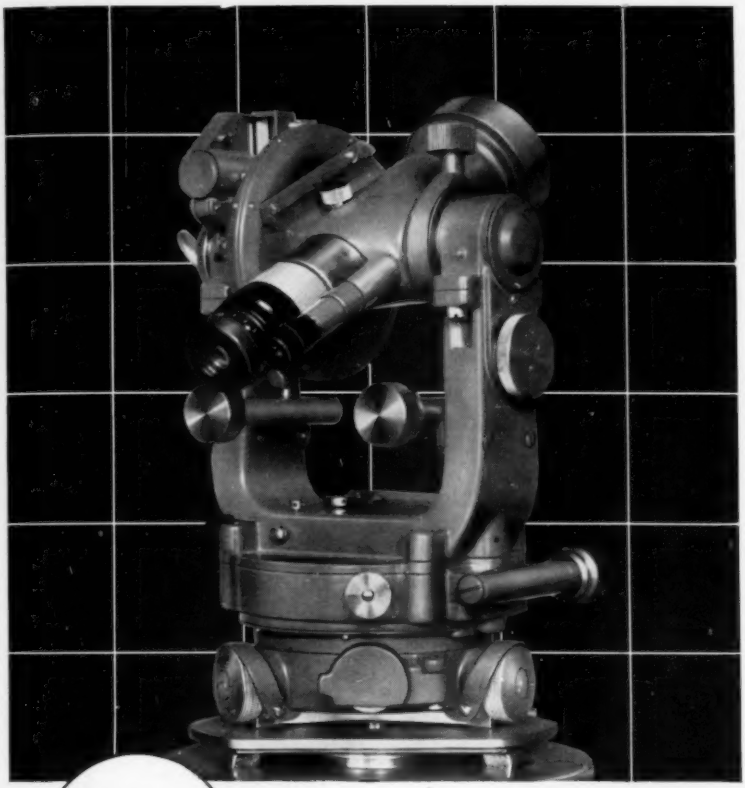

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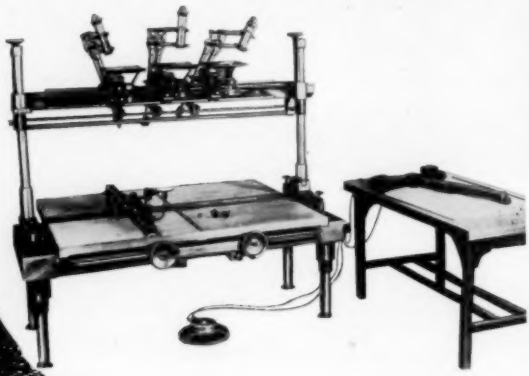

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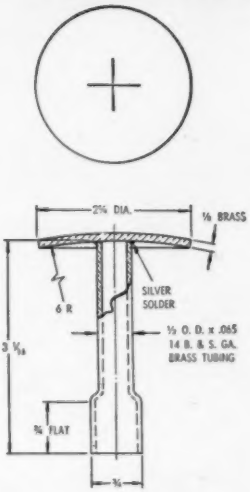

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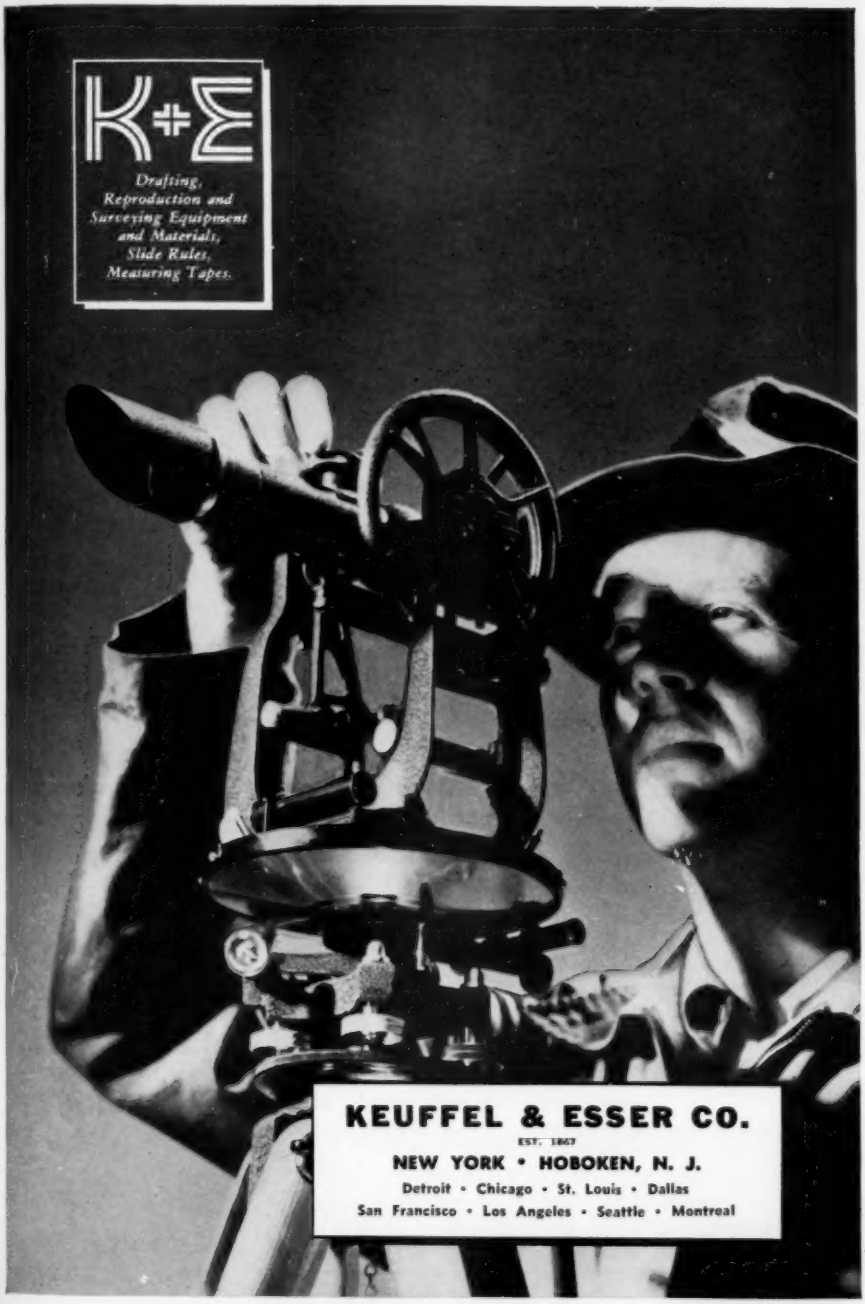
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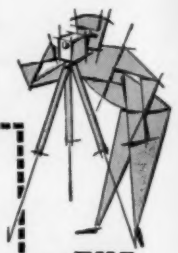

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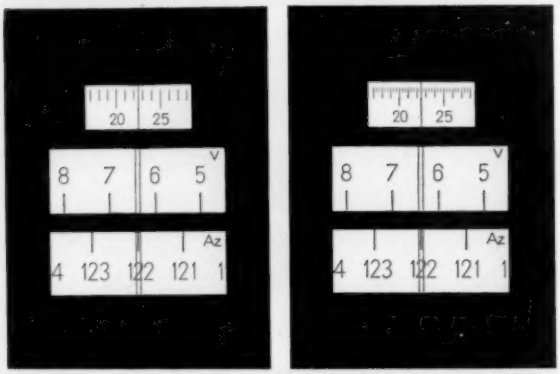

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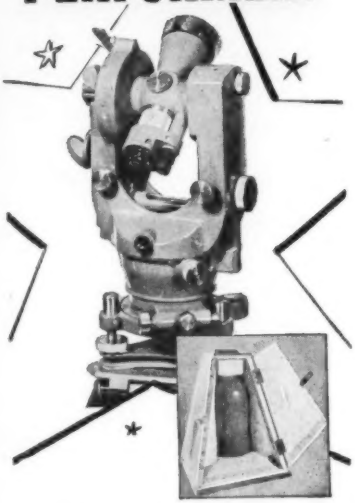

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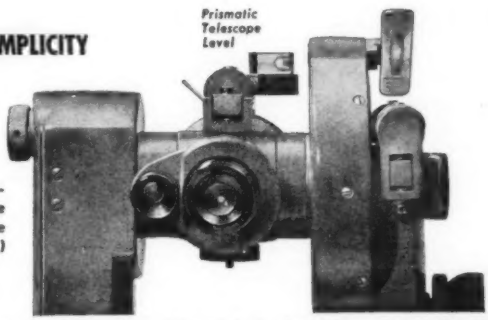

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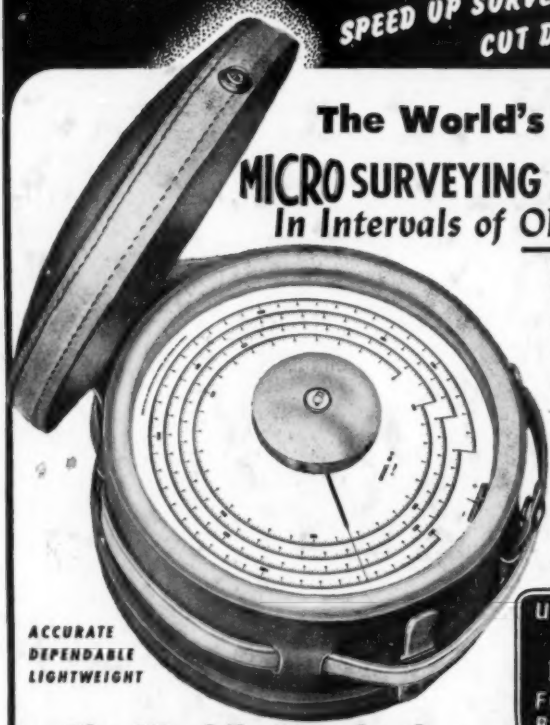

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